



PRACTICAL WORKSHOP ON FINANCIAL ENGINEERING USING ADVANCE DERIVATIVES

Application of Valuation Frameworks, Derivatives Tools, Techniques and Implementation Mechanics

01 – 03 June 2015 - DUBAI





OVERVIEW

Turbulent decades of economic crises and increased volatilities across all asset classes have brought about innovative solutions in derivatives to manage risk. These developments and the recent dramatic failure in appraising derivatives models, place a heavy emphasis on institutions' ability to assess the risks of derivatives, which have been blamed for exacerbating the present crisis in financial markets.

Despite the debate, derivatives are still the strategic instruments of choice to manage financial risks and create value. Their failure has typically been due to a lack of understanding on how to use and price derivatives. Understanding their dynamics, risks, valuations and uses has become more important than ever. The recent credit market turmoil, for example, has witnessed a wide variety of approaches that seem to have little in common.

However, the key to understanding derivatives is that all products, no matter how complex, are portfolios of just two fundamental building blocks: a swap (forward) and an option. **This workshop provides this understanding in a rigorous, consistent and coherent framework.**

INTRODUCTION TO THE COURSE

Financial Engineering (FE) is a multi-disciplinary function drawing from finance and economics, mathematics, statistics, engineering and computational studies. The emphasis of **FE** will be on the use of simple stochastic models to price derivative securities in various asset classes including equities, fixed income, credit and assets or mortgage-backed securities. The workshop will also consider the role that some of these asset classes played during the financial crisis of last decade.



Participants who attend the course will begin to understand the "rocket science" behind financial engineering but perhaps more importantly, we hope they will also understand the limitations of this theory in practice and why financial models should always be treated with a healthy degree of scepticism. The follow-on course with practice on computer based workshop will continue to develop the understanding of participants on derivatives pricing models but it will also focus on asset allocation and portfolio optimization as well as other applications of financial engineering such as real options, commodity and energy derivatives, volatilities and algorithmic trading.

The workshop participants will see how one basic idea, price equals expected discounted payoff, unites everything; models that describe *stocks, bonds, options, real investments, discrete time, continuous time, asset pricing, portfolio theory*, and so forth.

The participants will witness classic factor pricing models in action, first by studying the **Fama French three factor model** and then by studying the question whether portfolio managers have the skill or not. They will look in depth at the time-series predictability of returns, bubbles, and volatility. The workshop will guide the equity premium and the link between asset pricing and macroeconomics. It will further extend the theory to cover options, then bonds, and study the facts about the term structure of interest rates. The course closes with portfolio theory, how should investors structure their investment portfolios.

The math in real, academic, finance is not actually that hard. Understanding how to use the equations, and see what they really mean about the world... that's hard, and that's what the facilitator will be uniquely describing in different sessions of workshop.

WORKSHOP WORKFLOW SYNOPSIS & SPECIFIC LEARNING OUTCOMES

MODULE 1

Yield Curves, Swaps & Interest Rate Derivatives

Yield Curve Derivatives:

1- Hedging / Arbitrating Taxonomy, Markets Linkage & Overview

- Risk measures, concept of volatility & model specific valuations
- Decomposition into simpler (fixed, floating, contingent) cash flows

2- Forward Rate Agreements (FRAs)

- FRAs, swaps & futures: convexity bias adjustment

Computer Workshop: FRAs cash flows

3- Fundamentals of Yield Curve Construction (Interest Rate Swaps & Micro-Structure)

- **Computer Workshop: Swap fixed leg cash flows**

4- Stochastic Floating Cash Flow Valuation (Some Key Results)

- Valuing unknown LIBOR cash flows
- Key strategic (static) replicating portfolio & exit strategies
- Forward rate method & spot-forward parity
- Principal (FRN, Synthetic Bond) Method

5- Swap Yield Curves & Zero-Coupon Valuation

- Par money market (spot LIBOR) and swaps (forward LIBOR) rates
- “Stripping” par-rates curve
- “Bootstrapping” zero-coupon bond price curve
- Audit checks: profit & loss: principal & forward rate methods
- Effective yield-to-maturity, zero-coupon bond yield curve

Computer Workshop: Constructing annual swap stripping “special” one-year semi-annual equivalent par rate

Computer Workshop: Constructing semi-annual swap

6- Off-Market Swap Points

- Linear, geometric (log-linear), exponential & spline interpolations
- **Computer Workshop: Exponential interpolation**

7- Interest Rate Futures

- Forward rate, futures price/rate, convexity adjustment
- First futures stub rate, futures strip zero-coupon bond prices

Computer Workshop: Bootstrapping futures strip zeros

- Integrating money, swap & futures curves

Computer Workshop: Incorporating futures strip prices

8- Principal Component Analysis (PCA) & Swap Pricing

- Yield curves dynamics: Shifts, tilts & turns
- Correlation, factor components & volatility (cone) surface

9- FX Currency Swaps

- Equivalent bond positions
- Equivalent forward exchange positions

Computer Workshop: Valuing FX currency swaps

10- Non-Standard & Off-Market Swaps

- Amortising swaps, accreting swaps & rollercoaster swaps
- Pricing LIBOR-in-arrears (DRS) interest rate swaps
- Limitations of forward rate method & volatility model

Computer Workshop: Valuing existing off-market swaps

MODULE 2

Optionality: Equity, FX & Interest Rate Options

Derivatives Contracts:

11- Fundamental Building Blocks, Arbitrage Boundaries, Synthetics & Strategies

- Arbitrage boundaries & properties of option pricing
- Determinants of an option’s value
- Option strategies & payoffs
- Covered call writing – PERCS, DECS
- * M-KMV structural model of credit risk
- * Mertonian structural model of credit risk
- Protective puts: Portfolio insurance
- Put-call parity
- ✓ Accounting, tax and regulatory arbitrage
- ✓ Locking in unrealised speculative profits
- ✓ Zero-cost collars
- ✓ Capital structure arbitrage
- ✓ Securitisation & CDOs

Computational Workshop Exercises:

12- Structured Product Solutions; Embedding & Embedded Options

- Bank loan decisions (embedding options)
- Real estate and credit risk analysis (embedded options)
- Zero-cost collar
- Creative Security design embedded options
- ✓ Explore creation of hybrid securities and contingent forms of payment & embedded optionalities
- ✓ Tax, accounting & regulatory arbitrage

13- Derivatives Valuation: Concepts & Insights

- Overview of valuation models
- Intuitive concepts: Binomial option pricing model
- * ✓ Portfolio duplication (replication) approach
- * ✓ Self-financing strategy approach
- * ✓ Risk-neutral (martingale) probability approach

Computer Workshop: Binomial option pricing model

- Black–Scholes option pricing model
 - Options insights of valuation and risk management
- Computer Workshop: Black–Scholes option pricing model**

14- Understanding Options Risk: Stock Exposure (Delta)

- Delta hedging/replication as cost of option
- Monte-Carlo simulation: Delta-neutral hedging strategy

Computer Workshop: Delta-neutral exit strategy cost

15- Volatility (Convexity) Risk Mechanics

- Delta-neutral long volatility trade and hedged portfolio
- Mechanics and essence of buying volatilities (long gamma)
- Time-decay (Theta) effects of delta and gamma

Computer Workshop:

Long volatility (Gamma) trading

16- FX Currency Options

- Arbitrage bounds, zero-cost collars, risk reversals, butterflies
- Structured products and implications for corporate treasurers
- Binomial and Black–Scholes (Garman-Kolhagen) valuation
- Exotic currency options

Computer Workshop: Pricing FX options

17- Interest Rate, Yield Curve Volatilities & Options: Portfolio of Options on FRAs

- Interest rate options: Caps/floors
 - ✓* Valuation of caps: Black's (1976) market model
 - ✓* Valuation of interest rate floors: Cap/floor-swap parity
- Computer Workshop: Pricing interest rate caps and floors
- ✓* Using flat brokers' (market's) volatilities
 - ✓* Using term-structure of volatilities (volatility surface)

18- Option on Portfolio of FRAs (Swaps)

- Options on interest rate swaps: Swaptions
- ✓* Black (1976) market model valuation of payers/receiver Swaptions

Computer Workshop: Pricing Swaptions

- ✓* Hedging cap with Swaptions

19- Volatility Surface Asymptotics

- Volatility skews, volatility smile effects
- Stochastic Alpha Beta Rho (SABR) Black (1976) model

20- Yield Curve Models: Motivation

- Inconsistencies in applying Black–Scholes/Black(1976) models
- Black (1976) cap/floor pricing bias & convexity adjustment
- Effects of interest rate volatility on bond prices

Computer Workshop: Yield curve model & convexity adjustment (1976) models

Derivatives Pricing Tools:

21- Fundamental Theorem

- Applied to interest rates & fixed-income options
- Arrow–debreu state primitive prices (stochastic discount function)
- State prices, risk-neutral & martingale probabilities

22- Yield Curves Models

- Equilibrium and fitting no-arbitrage models
- ✓* Vasicek, Cox–Ingersoll–Ross (CIR),
- ✓* Ho–Lee, Hull–White,
- ✓* Black–Derman–Toy (BDT) & HJM/BGM LIBOR Market Model (LMM)

Implementing & Calibrating Yield Curve Models: One-Factor Models

23- Black-Derman-Toy (BDT) Model: Implementation

- Main features of BDT model
- Term structures of interest rates and volatilities

24- Black-Derman-Toy (BDT) Model: Applications

- Valuing interest rate options: Caps/floors
- Valuing European coupon bond options
- Valuing Bermudan coupon bond options
- Valuing payer/receiver swaptions
- Valuing swaps and bonds with BDT model

Computer Workshops:

- ✓* Constructing Black-Derman–Toy (BDT) yield curve model
- ✓* Valuing interest rate caps, bond options, swaptions, futures
- ✓* Valuing Bermudan options, interest rate swaps
- ✓* Comparison of BDT & Black (market) models – Convexity adjustment

MODULE 3

Credit Risk Derivatives Models:

Credit Default Swaps (CDS):

25- Structure, Pricing & Hedging

- Decomposing default able risky bond
- Isolating underlying default (credit) risk using swap/CDS
- Adding swap floating LIBOR-based payments
- Pricing the CDS premium leg & protection leg

Computer Workshop: Pricing Single-Named CDSs

26- Main Uses of Credit Derivatives Mertonian/KMV Structural Model (Firm Assets) Approach

- Embedded complexities of interim cash flows
- ✓* Effects of dividends on default risk
- ✓* Effects of capital structure on default risk
- ✓* Effects of investments on default risk
- Recapitalisation effects

Computer Workshop:

27- Mertonian/KMV Binomial Models

- **Credit (default) risk measurement spread sheet (Based on the mertonian option pricing methodology and study the effects of dividend, capital structure and investment policies on default risk)**

28- Jarrow–Turnbull (JT) Reduced-Form (Intensity-Based) Model: Applying Term Structure Models

- Stochastic term structure of default-free interest rates
- The Markov process for credit ratings
- Stochastic maturity specific credit-risk spread
- Implementing a discrete-time Markov model
- ✓* Pricing credit risky bonds
- ✓* Pricing options on credit risky bonds
- ✓* Pricing vulnerable derivatives
- ✓* Credit Default Swaps (CDS)

Computer Workshop:

29- Jarrow–Turnbull Reduced-Form Model

TRAINING METHODOLOGY

All our courses focus on the practical application of the tools and techniques employed in the Capital Markets, Treasury and Derivative business. This can only be achieved once participants are fully comfortable with the fundamental theoretical concepts of the topics at hand. To achieve this, each learning point is consolidated by case studies, both in groups and on individual discussions.

WORKSHOP OBJECTIVES

Owing to its intensive format, this workshop will prove invaluable in giving participants the opportunity to concentrate exclusively on the subject without any distractions. Here are some of the unique factors that make this course an essential learning experience:

- Strictly limited numbers mean that participants will receive maximum personal attention and coaching throughout the workshop sessions
- The intensive format of the course ensures that participants can focus completely on learning and improving their understanding on the developing the structured products using simple, advance and complex derivative domain

The workshop will focus on building the intuition and deep understanding of how the theory works, how to use it, and how to connect it to empirical facts. This first part builds the basic theoretical and empirical tools around some classic facts. The second and third parts deal more deeply into applications and empirical evaluation.

This intensive course provides detailed insights into the principles, methods and mathematical tools for understanding the analytics of derivatives structuring, uses, valuation and risk management. It discusses the economic intuition behind each important aspect of derivatives in order to show how they can be understood in a more sophisticated way, bridging the gap between theory and practice. The concepts and mathematics are set and illustrated by detailed worked examples from the marketplace. The course involves extensive modelling and computations using Excel spread sheets.

TARGET AUDIENCE

The workshop is intended for professionals working in any sorts of treasury functions, investment bank, money-management firm, hedge funds, risk management and insurance companies and wants to better understand financial engineering models and relevant buzzwords like beta, risk premium, risk-neutral price, arbitrage, equity premium, and discount factor. The participants will witness how one basic idea, price equals expected discounted payoff, unites everything- models that describe stocks, bonds, options, real investments, discrete time, continuous time, asset pricing, portfolio theory, and so forth.

YOUR INVESTMENT

With a small investment of U.S. Dollars 2,500 your nominee will acquire and enhance their theoretical and practical knowledge on:

- ✓ Valuation and modelling of fixed income and equity-linked derivatives
- ✓ The practicalities behind options; their trading, structuring and risk mechanics
- ✓ Recent developments behind integrated stochastic yield curve models
- ✓ Securitization and hybrid corporate credit-risky securities
- ✓ Credit derivatives and an introduction to credit risk models
- ▶ as well as key technical skills and an understanding of the two core derivatives valuation tools: Model-free swaps (forwards) and Model-dependent options



An early bird discount of 15 % is offered for nomination received before 30 April 2015. **(3 or more nominations from the same organisation qualify for a 25% discount off the combined course fees).**

COST EFFECTIVE SOLUTION

Our in-house training programmes are a cost effective solution for you. They allow you to determine the exact content, structure, length and location of your training, with the end result of enhancing the performance of your professionals. Our trainers come to you, thus saving time and costs, and enabling your team to benefit from a confidential and convenient environment.

HOW TO REGISTER

You can register by sending an email at info@consultinganz.com or alternatively, please call at +971 (4) 458 33 44 and provide details of your nominee(s) i.e.: Name, Title, Telephone number and email address of your nominee(s).

BOOKING CONFIRMATION

Once we have processed your booking, we will send you a confirmation email, invoice and detailed agenda of the workshop day, venue etc.

WORKSHOP FACILITATOR

Syed Adeel Hussain, Assistant Professor – Actuarial Science and Risk Management

Syed Adeel Hussain is currently teaching Actuarial Science and Risk Management Modules as an Assistant Professor at IOBM – Institute of Business Management. He has extensive experiences of Bank and Corporate Training and Working within the realm of the Financial Services Industry. Some of his most notable recent assignments include working as the Head of Quantitative Risk Analytics at Tadhamon International Islamic Bank in Yemen and Bahrain and as the Head of Risk Management at the Dawood Islamic Bank, Pakistan. He has also paid services as the Head of Risk at Faysal Asset Management Ltd. Being visiting faculty at different training institutes in Pakistan and GCC region, Mr. Hussain is fond of sharing his practical knowledge, experience with incumbents in financial markets.



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