Certificate in Financial Maths & Modelling Syllabus

TREASURY, RISK AND FINANCE PROFESSIONALS ACT

Overview

The Certificate in Financial Maths & Modelling provides a rigorous and integrated set of quantitative tools to understand and explain financial instruments, financial risk and corporate value and the fundamentally important relationship between them. The emphasis throughout is on the practical modelling of real life problems and opportunities. Techniques such as no-arbitrage pricing, duration, convexity and portfolio analysis - including the trade-off between risk and return - are explained and applied. The course analyses the use of options for financial risk management, and the valuation of different types of option using binomial pricing models, the Black Scholes model and other techniques. It also introduces and applies Value at Risk measures, their potential uses and their limitations.

Study Unit 1 - Fundamental concepts in financial maths and modelling

Study Unit 1 introduces the fundamental concepts of financial maths and modelling in the five areas of: interest rate mathematics; modelling the values of a series of fixed or growing future cashflows; modelling the term structure of interest rates using no arbitrage relationships; selected issues in probability and statistical models; and modelling the maths of Value at Risk.

Study Unit 2 - Modelling the maths of debt

Study Unit 2 looks at modelling the maths of debt in the main areas of: present values, future cash flows, timing and risk; and interest rate sensitivity and duration models, in particular value relationships with respect to yield, maturity, coupon rate and coupon frequency.

Study Unit 3 - Modelling the maths of foreign exchange

Study Unit 3 introduces the concepts of modelling the maths of foreign exchange in the four areas of: quoting conventions; hedging using forward foreign exchange contracts; the relationships between foreign exchange rates, interest rates and inflation rates and applying VaR to foreign exchange risk management.

Study Unit 4 - Modelling the maths of derivatives

Study Unit 4 covers the maths and modelling of derivatives in the two areas of: introduction to derivatives mathematics; and modelling capital market swap mathematics.

Study Unit 5 - Modelling the maths of options

Study Unit 5 covers the maths and modelling of options in the four areas of: option payoff mathematics; option payoff maths in the context of hedging; option valuation modelling; and options arbitrage and the put-call parity relationship.

Study Unit 6 - Modelling the maths of portfolios and corporate finance

Study Unit 6 introduces the fundamental concepts of modelling the maths of portfolios and corporate finance in the two areas of: modelling portfolios - analysis of risk and return, and modelling for corporate finance - corporate valuation and the impact of changing capital structure.

Study Unit 1 – Fundamental concepts in financial maths and modelling

Unit introduction
1.0.1 Notation and rules of algebra
1.0.2 Financial modelling

Section 1 – Interest rate mathematics
1.1.1 Interest calculations and quoting conventions
1.1.2 The time-value relationship

Section 2 – Modelling values of a series of future cashflows
1.2.1 Infinite series cashflows (perpetuities) and their valuation
1.2.2 Finite series cashflows (annuities) and their valuation

Section 3 – Modelling the term structure of interest rates: no arbitrage relationships
1.3.1 Zero coupon, forward and par structures of interest rates: different forms of yield curves
1.3.2 No arbitrage relationships between zero coupon, forward and par rates

Section 4 – Probability and statistical models: selected issues
1.4.1 Measures of central location (or central tendency), dispersion and correlation
1.4.2 Frequency distributions in theory and in practice

Section 5 – Modelling the maths of Value at Risk
1.5.1 Modelling the maths of Value at Risk for single risks
1.5.2 Extending the modelling of Value at Risk

Study Unit 2 – Modelling the maths of debt

Section 1 – Short term debt
2.1.1 Short term debt issuers, market participants and market conventions
2.1.2 Calculation of interest and valuation of short term debt instruments

Section 2 – Longer term debt
2.2.1 Analysis and valuation of bonds
2.2.2 Real interest rates and inflation indexing

Section 3 – Interest rate sensitivity and duration models
2.3.1 Duration and interest rate price sensitivity, relative and absolute measures
2.3.2 Interest rate immunisation, convexity and modified convexity

Study Unit 3 – Modelling the maths of foreign exchange

Section 1 – Foreign exchange mathematics
3.1.1 Converting between currencies: using spot foreign exchange rates
3.1.2 Converting between currencies: determining and using forward foreign exchange rates
3.1.3 The maths of foreign exchange risk management
3.1.4 Applying Value at Risk to foreign exchange risk management

Study Unit 4 – Modelling the maths of derivatives

Section 1 – Introduction to derivatives mathematics
4.1.1 Payoffs for fixing derivatives and options
4.1.2 The maths of FRAs: cashflows, hedging, valuation and basis risk
4.1.3 Futures contracts: cashflows, hedging and valuation

Section 2 – Modelling swap mathematics
4.2.1 The maths of capital market swaps including interest rate swaps
4.2.2 The maths of cross-currency interest rate swaps

Study Unit 5 – Modelling the maths of options

Section 1 – Option payoff mathematics
5.1.1 Payoffs from trading strategies with single options
5.1.2 Payoffs from trading strategies involving more than one option

Section 2 – Option payoff maths: hedging and hedged results achieved
5.2.1 Hedging a portfolio: options plus underlying asset/(liability)
5.2.2 Hedging corporate exposures with options

Section 3 – Option valuation modelling
5.3.1 Binomial option valuation models
5.3.2 Black Scholes option pricing model
5.3.3 Arbitrage and the put-call parity relationship

Study Unit 6 – Modelling the maths of portfolios and corporate finance

Section 1 – Modelling portfolios: analysis of risk and return
6.1.1 Modelling simple portfolios: analysis of risk and return
6.1.2 Modelling multi-asset portfolios & portfolios including liabilities

Section 2 – Modelling for corporate finance
6.2.1 Modelling the cost of corporate capital
6.2.2 Modelling the relationship between corporate value and capital structure
6.2.3 Modelling corporate valuation