

Mathematics Department
Brooklyn College, City University of New York
Math 3601 (Investment Science) Syllabus
4 hours, 4 credits

Introduction

Cash flows, comparison principle, arbitrage, typical investment problems (pricing and hedging)

Basic Theory of Interest

Simple and compound interest, net present value, internal rate of return, evaluation of investment projects, cash cycle problems

Fixed income securities

Valuation of annuities(perpetual and finite-life), annual worth, amortization, bond pricing, yield rate, price-yield curve, Macaulay duration, modified duration, duration of a portfolio.

Term structure of interest rates and applied interest rate analysis

The yield curve, spot rate, forward rate, short rate, expectation dynamics, spot rate forecasts, invariance theorem, running present value, Fisher-Weil duration, Quasi-modified duration, capital budgeting, cash matching, running dynamic programming, Harmony theorem.

Mean-variance portfolio theory and Capital Asset Pricing Model(CAPM)

Review of basic probability, Portfolio mean and variance, minimum variance set, efficient frontier, the Markowitz model, two-fund theorem, one-fund theorem, capital market line, beta of a portfolio, security market line, CAPM as a pricing formula, arbitrage pricing theory.

Introduction to derivative securities

Forwards, futures and swaps, binomial lattice model, random walks, Wiener process, stock price process, Ito's lemma, option concepts(call and put options), put-call parity, binomial option pricing theory, risk-neutral pricing, Black-Scholes equation, Black-Scholes formula. Greeks, volatility smile.

Other topics

Value at risk and its computations, conditional value at risk, other risk measures.