This is a first class on derivatives, options, contingent claims, and other financial structures and contracts. It discusses pricing and hedging theories together with some basic market models. The mathematical tools of stochastic calculus and partial differential equations are developed as needed. Homework assignments will be theoretical as well as computational (Excel, VBA, simple C++).

This is a tentative weekly syllabus for the 14 weeks of the semester.

1. Forward contracts, arbitrage pricing and the forward price. Futures markets, settlement, and the effect of unknown interest rates. European style puts and calls on equities, payout diagrams, kinds of bets. Lognormal model of equity prices, the effect of option nonlinearity, P&L distributions via simulation.

2. General theory of arbitrage pricing in a discrete one period model. The multi-period binomial model, Delta hedging with the underlier or a forward.


volatility (≠ implied vol surface) surface. Qualitative properties of the solution of a backward equation – why you can’t go forward.


11. One factor short rate models and the yield curve. The Feynman Kac formula and affine models (lots of math here).

12. Interest rate derivatives such as treasury options and swaptions. Pricing interest rate derivatives using Black’s method.
