Contingent Claims Pricing

Detailed outline

1. European contingent claims
2. No-arbitrage price or replication cost as $\mathbb{P}^*$-expected discounted payoff
   (“risk-neutral” pricing)
3. The Markovian financial market
   (a) The fundamental valuation PDE (Feynman-Kac Theorem)
   (b) Hedging and replicating trading strategies
4. Examples
   (a) Options
   (b) Forward contracts
   (c) Futures contracts

Readings

Domenico Cuoco’s lecture notes, parts IV and V.


Duffie, chapters 5 and 6.


Problems

1. Derive the (Margrabe) valuation formula for a European option to exchange asset 1 for asset 2 under the assumption that each asset’s dividend rate and volatility is nonstochastic. Describe the dynamics of the replicating trading strategy.

2. Derive the (Merton) European call option valuation formula in the case that both the underlying stock and the zero-coupon bond maturing on the option expiration date have nonstochastic volatility and the stock has a nonstochastic dividend rate. Determine the replicating trading strategy.

3. Suppose the market coefficients are constant. Derive the (Black-Scholes) European call and put option valuation formulas (with dividends) and the replicating trading strategies.

4. In the constant coefficients case, compute the value of a claim that pays the average stock price from 0 to $T$. 