

The Multi-Period CRR Model
Mathematical Finance
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Multi-Period Binomial Model (Cox-Ross-Rubinstein Model)
Review Sheet

1. Statement of the goal of the investigation
2. Description of the Multi-Period CRR Model including
 - (a) primary market, the model assumptions, and the notation
 - (b) European contingent claims
 - (c) American contingent claims
3. Definitions: know statements
 - (a) Viable financial market
 - (b) The time t partition for $0 \leq t \leq T$
 - (c) The time t σ -algebra for $0 \leq t \leq T$
 - (d) Trading strategy for the primary market
 - (e) Self-financing trading strategy for the primary market
 - (f) Replicating strategy for a European contingent claim
 - (g) Snell envelop for an American contingent claim
 - (h) Risk neutral probability
 - (i) Conditional expected value of a random variable given a σ -algebra generated by a partition
 - (j) \mathbf{P}^* -martingale
 - (k) Manufacturing cost of a trading strategy for the primary market
 - (l) Trading strategy for the secondary market with a European contingent claim
 - (m) Self-financing trading strategy for the secondary market with a European contingent claim
 - (n) Arbitrage opportunity for the secondary market with a European contingent claim
 - (o) Arbitrage opportunity for the secondary market with an American contingent claim (two types)

- (p) Discounted process
- 4. Properties of conditional expected value: know how to use them
 - (a) Independence
 - (b) Linearity (including the ability to factor out random variables that are measurable with respect to the σ -algebra).
 - (c) Tower Property (the coarser σ -algebra wins).
- 5. Properties of \mathbf{P}^* -martingales
 - (a) Extended \mathbf{P}^* -martingale property (cf. hwk 6 # 4a): know statement and proof
 - (b) Doob's stopping theorem: know statement
- 6. Lemmas: know statements, proofs
 - (a) Existence and uniqueness of the replicating strategy (statement and computation the replicating strategy only, i.e., no proof)
 - (b) Computing the superhedging strategy
 - (c) Properties of the superhedging strategy
 - i. Self-financing
 - ii. Relationship with the snell-envelop including manufacturing cost and superhedging property
 - (d) Risk Neutral Property
 - (e) \mathbf{P}^* -martingale property for the value process of any self-financing trading strategy in the primary market.
 - (f) Manufacturing cost lemma for European contingent claims
 - (g) Manufacturing cost lemma for American contingent claims
- 7. Contingent claim pricing theorems for both European and American contingent claims
 - (a) Know Statement
 - (b) Ability to prove arbitrage free when the claim is correctly priced
 - (c) Ability to use the manufacturing cost lemma to calculate the arbitrage free price
 - (d) Ability to construct a specific example of an arbitrage opportunity and to verify that your example is in fact an arbitrage opportunity