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Discrete-Time Mathematical Finance

Assignment sheet 5

Exercise 1 (4 points)

Recall the market in Exercise 2 of Assignment sheet 3 and consider the set $\mathcal{D}$ of replicable contracts which dominate Call(7,1,1), i.e.,

$$\mathcal{D} = \{\eta \in \mathcal{H} \,|\, \forall \omega \in \Omega \;\; \eta(\omega) \geq \mathrm{Call}(7,1,1)(\omega)\}.$$

For which $\eta \in \mathcal{D}$ does the hedging price $\widehat{\pi}(\eta)$ become minimal?

Exercise 2 (1+2+1=4 points)

Let $\mathcal{M}$ be a finite one-period model where $\Omega = \{\omega_1, \omega_2\}$, $D = 1$, $S_0^0 = 100$, $S_1^0 = 110$ and

$$S_0^1 = 80,\; S_1^1(\omega_1) = x, \;\; S_1^1(\omega_2) = 100.$$

(a) For which values of $x \in \mathbb{R}$ is the market complete?

(b) Find, in dependence of $x \in \mathbb{R}$, the set of all equivalent martingale measures.

(c) There are values of x, for which the market is complete but no equivalent martingale measure does exist. Why isn't this a contradiction to the Second Fundamental Theorem of Asset Pricing?