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Saarland University, Winter Term 2017/18

November 17, 2017

Discrete-Time Mathematical Finance

Assignment sheet 4

Exercise 1 (2+1+1 points)

Let $\mathcal{M}$ be a finite market with $\mathcal{T} = \{0,1\}$, $\Omega = \{\omega_1, \omega_2, \omega_3\}$, $D = 2$, $\mathcal{F}_0 = \{\emptyset, \Omega\}$ as well as $S_0^0 = 100$, $S_1^0 = 105$ and

$$S_0^1 = 50,\ S_1^1(\omega_1) = 40,\ S_1^1(\omega_2) = 50,\ S_1^1(\omega_3) = 60,$$

$$S_0^2 = 20,\ S_1^2(\omega_1) = 40,\ S_1^2(\omega_2) = 20,\ S_1^2(\omega_3) = 10.$$

(a) Find a linear price system π for this market.

(b) Compute $\pi(\text{Call}(15,1,2))$.

(c) Use the put-call parity to compute $\pi(\text{Put}(15,1,2))$.

Exercise 2 (4 points)

Let $\mathcal{M}$ be a finite one-period model which is arbitrage-free. Show that the set

$$\mathcal{I}_\xi := \{\pi(\xi),\ \pi \text{ linear price system}\}$$

is an interval for any contract ξ.
Hint: First show that the set of linear price systems is convex.