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Discrete-Time Mathematical Finance

Assignment sheet 9

Exercise 1 (4 points)

Let $\xi = (R - S_K)_+$ be a European Put option in the CRR-model. Show that

$$\hat{\pi}(\xi) = \frac{R}{(1+r)^K} G(m(R), K, q) - S_0 G(m(R), K, q^*),$$

where

$$\begin{aligned} G(k, K, p) &= \sum_{j=0}^{k} \binom{K}{j} p^j (1-p)^{K-j}, \\ m(R) &= \sup_{n \in \mathbb{N}} \left\{ n < \log\left(\frac{R}{S_0(1+y_b)^K} \right) / \log\left(\frac{1+y_g}{1+y_b} \right) \right\}, \\ q^* &= q \frac{1+y_g}{1+r} = \frac{r - y_b}{y_g - y_b} \frac{1+y_g}{1+r}. \end{aligned}$$

Use the put-call parity to derive a corresponding formula for a Call option.

Exercise 2 (4 points)

Prove Lemma 4.2.2 of the lecture.