Math 454 - Spring 2023 - Homework 08

Published: Tuesday, March 7, 2023

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by this date.

SCF2 (Shreve Textbook):
ch.1 - 4 (skip ch.4.7)

MF454 lecture notes:
ch.2 - 12.1

Other:
Nothing assigned yet

New reading assignments:

Reading assignment 1 - due Monday, March 13:

- Study EXTRA CAREFULLY MF ch.12.2 and ch.12.3. Here you are reaping the benefits of knowing the fundamentals of stochastic calculus and having spent so much effort on the abstract math of ch.4-6.

Reading assignment 2 - due: Wednesday, March 15:

a. Carefully read MF ch.12.4 - 12.5. It is not important for this course that you remember or even understand the extensive calculations (though it may be for a quant interview), but you shoulc understand and remember that the BSM function of Theorem 12.2 is the risk–neutral validation formula for a Eoropean call. See formula (12.29) of Lemma 12.2.
b. Carefully read SCF2 ch.4.6. We will not cover SCF2 ch.4.7 (Brownian bridge).

Reading assignment 3 - due Friday, March 17:

- Carefully read MF ch.12.6 through Remark 12.9. The stuff on correlation is computationally very simple.

Prove the following assignments closed book (once you have looked up the proposition).

Written assignment 1: Start with formula (9.4): $d\vec{S}_t \bullet d\vec{H}_t \ + \ \vec{S}_t \bullet d\vec{H}_t \ = \ 0$

to derive the formula (9.6): $dV_t^H \ = \ \vec{H}_t \bullet d\vec{S}_t$ for a self–financing portfolio.

Written assignment 2: Write from memory the definition of the Black–Scholes market model. Most important: the dynamics dB_t and dS_t, including the finance meaning of α, σ, r.

Written assignment 3: Derive formula (9.14) closed book. Then work open book, line by line, through the derivation of (9.15).

Written assignment 4: Work open book (SCF2(!), ch.4.5.1), line by line, through the proof of Proposition 9.2.

Written assignment 5: Read Remark 9.6.B. Then think through the finance reasoning why $c(t,x) \approx (x - e^{r(T-t)}K)$ for large stock price x.

Written assignment 6: Re-read either in SCF2 or in MF the derivation of the put-call parity formula. Then do it closed book.

Written assignment 7: Familiarize yourself with some software that computes option prices for you. The links in Remark 9.8 still work, but they are two years old, and there may be better ones.