

IEOR E4706: FE: Discrete-Time Asset Pricing (Fall 2004)

Columbia University

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Assignment 5: Due Tuesday November 23rd

The first four questions refer to the *Martingale Pricing Theory* lecture notes. Recall the securities are numbered from 0 to 2.

Question 1

Find the price of an American put option on the second security of Example 9 with strike $k = 3$ and expiration $T = 2$.

Question 2

Compute the date $t = 0$ price of a forward contract for delivery at date $T = 2$ of the second security in Example 9.

Question 3

Compute the date $t = 0$ price of a futures contract on the second security of Example 9 that expires at $T = 2$. Is the futures price different to the forward price? Are you surprised?

Question 4

Referring to Example 10, suppose we changed the payoffs of the 1st and 2nd securities in states ω_4 and ω_5 so that the model was arbitrage-free. (By leaving the payoff of the 0th security unchanged at 1.1025 in those states, we maintain its interpretation as the cash account.) Now recall that this model is incomplete, implying in particular that there does not exist a unique EMM, Q .

(a) Show that equation (14) of the *Martingale Pricing Applied to Options, Forwards and Futures* lecture notes still holds, irrespective of which Q we use. In particular, a unique arbitrage-free futures price process is computable.

(b) Give an example of two-period financial market where a unique arbitrage-free futures price process on a particular underlying security does *not* exist.

Question 5

Investment Science: Q12.5 (Use a 6-period lattice and price a European and American call.)

Question 6

Investment Science: Q12.6.

Question 7

Investment Science: Q12.7.

Question 8

Investment Science: Q12.9.

Question 9

Investment Science: Q12.15.