m3f33prob5

M3F22 PROBLEMS 5. 10.11.2017

The current price of gold is \$1,146 per ounce: say \$ 1,150 per oz. for round figures.

In a year's time, the price of gold will be up to 1200 with probability p, and down to 1050 with probability $1 - p$.

Neglect interest.

Q1: *Pricing.* Price a call option C for an ounce of gold in a year's time, with strike price K the current price 1150 (that is, find the *no-arbitrage price*).

Q2: *Hedging.* The option is financially equivalent to a combination (or *portfolio* Π) of cash and gold: *which* combination?
[The combination is called the *hedge*, or hedging strategy: holding it enables us to sell the option, and prepare to meet the resulting claim against us (if any).]

Q3: *Arbitrage.*
(i) You see C being traded now for \$ 40. What do you do?
(ii) You see C being traded now for \$ 20. What do you do?

Q4 (*Exam* 2016-17 Q2). In a two-period binary model, at each node the stock goes up by a factor of 5/4 or down by a factor of 4/5, each with positive probability. The payoff is $(S - 8)_+$, with S the final stock-price; the initial stock-price is 8. Neglect interest.
(i) Find the martingale probability p^* that the stock goes up.
(ii) Working down the tree, find the value of the option at each node.
(iii) Working up the tree, find the hedging portfolio at the time-0 and time-1 nodes.

NHB