EXAM MFE QUESTIONS OF THE WEEK

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Week of April 23/07

The price of gold today is $600 per ounce. The risk free interest rate is annual effective 10%.
A binomial model for the price of gold has a value of gold one year from now of either $700 or $620. A
European call option on a forward contract for delivery of an ounce of gold 2 years from now has an
expiry date of 1 year from now. The option strike price is $700 (for a forward contract with delivery at
time 2). A replicating portfolio for the option is created using Δ ounces of gold and B in risk free
investing or borrowing. Determine Δ and B, and find the value of the option today.

The solution can be found below.

Week of April 23/07 - Solution

If the price of gold in 1 year is 700, then the value of the option at that time is

$700 - \frac{700}{1.1} = 63.6364$, and if the price of gold in 1 year is 620, then the value of the option is 0 since

$620 - \frac{700}{1.1} = \; < 0$.

We can find the value of the option by constructing the replicating portfolio.

Δ ounces of gold and B in risk free investing or borrowing.

$700\Delta + 1.1B = 63.64$, $620\Delta + 1.1B = 0$.

This results in $\Delta = .795455$, and $B = -448.347364$.

The value of the replicating portfolio is $(.795455)(600) - 448.347364 = 28.9256$.

Alternatively, the risk-neutral probability of an up-step in gold price is $p^* = \frac{1.1 - \frac{620}{600}}{\frac{700}{600} - \frac{620}{600}} = .5$.

The risk-neutral expected present value is $\frac{1}{1.1}[(63.6364)(.5)] = 28.9256$.