Problem Set #3.
Valuation of a business tied to the copper price.

The objective of this assignment is to implement a real options valuation of a mine. You should use the 10 step binomial tree method from Assignments #1 & #2. All parameters are the same: set the drift in the copper price to 10%, the annual volatility to 28%, the risk-free rate to 5%, and the copper spot price to $2.65/pound. Assume that the appropriate discount rate to apply to copper related cash flows is 10% as in problem #3 of problem set #2. The output of the mine is fixed at 5,000,000 pounds per year. The forecasted annual operating cost is $12,500,000. Let us assume that a mine can not be abandoned so that the mine always operates.

(1) Determine the contingent cash flows throughout the binomial tree. First, determine the contingent revenue stream, then determine the contingent net cash flow.

(2) Value the revenue stream:
   a) First, use the risk-neutral methodology to determine the value of the risky revenue stream.
   b) Second, use the risk-adjusted discounting methodology to determine the value of the risky revenue stream.
   c) Third, use the forward prices from problem set #2 to determine the value of the revenue stream.

(3) Value the cost stream.
   a) First, use the risk-neutral methodology.
   b) Second, use the risk-adjusted discounting methodology.

(4) Value the net cash flow stream.
   a) First, use the risk-neutral methodology.
   b) Second, use the risk-adjusted discounting methodology.

(5) Now assume that the mine can be abandoned at no cost:
   a) Value the mine.
   b) Find the nodes where the mine is abandoned.
   c) Compare the value of a mine with no abandonment option and the one with abandonment option. Explain the difference.