THE OPTION TO DELAY AND VALUATION IMPLICATIONS

Problem 1
S = PV of $25 million a year for 20 years at 16% = $148.22 million
K = Cost of Taking Project = $300 million
t = 10 years
Standard Deviation = 20%
r = 12%
y = Dividend Yield = 1/ Project Life = 10%

Problem 2

a. PV of Inflows = 400,000 * 0.85 * (1 - 1.04^{25}/1.07^{25})/(.07 - .04) - 400,000 * 0.40 * (1 - 1.03^{25}/1.07^{25})/(.07 - .03) = $3,309,756

Fixed Costs associated with opening
= -3,000,000

NPV = 3,309,756 - 3,000,000 = $309,756

b. \( S = 3,309,756 \)
\( K = 3,000,000 \)
\( t = 25 \)
\( r = 7\% \)
\( \sigma = 0.25 \)
\( y = 1/25 = 4\% \)
Value of the Call Option = $828,674

c. The latter considers the option characteristics of owning the mine, i.e., that copper prices may go up, and that the mine-owner will be more likely to develop the mine at higher copper prices.

Problem 3
Current Value of Developed Reserve = 10,000,000 * ($20 - $6) = $140,000,000
Exercise Price = Cost of Developing Reserve = $120,000,000
t = 20 years
\( r = 7\% \)
\( s = 20\% \)
\[ y = 4\% \text{ (Alternatively, you can use 1/20 or 5\% as your cost of delay) } \]

Value of Call (Natural Resource Reserve) = $37,360,435

**Problem 4**

a. NPV of Project = $250 - $200 = $50 million

b. The option has the following characteristics:
   
   \[ S = 250 \]
   \[ K = 200 \]
   \[ r = 8\% \]
   \[ t = 5 \]
   \[ \text{Variance} = 0.04 \]
   \[ \text{Dividend Yield} = 12.5/250 = 5\% \]
   \[ \text{Value of Call (Project Rights)} = 68.68 \]

c. The latter captures the value of delaying the project. The difference between the two values will increase as the variance in the project cash flows increases.

**Problem 5**

a. \[ S = \text{PV of Cash Inflows on Project} = 250 \]
   \[ K = \text{Cost of Taking Project} = 500 \]
   \[ t = 10 \text{ years} \]
   \[ r = 6\% \]
   \[ s = 0.6 \]
   \[ y = 10/250 = 4\% \]
   \[ \text{Value of Call (Product Patent)} = 95 \text{ million} \]

b. It is an increasing function of the variance in project cash flows. This analysis suggests that the rights to products in technologically volatile areas are likely to be worth a great deal, even though the products may not be viable now.