IEMS 326
Homework 5

Please show all work! See the syllabus for homework policies.

1. Your company is considering whether to develop a new digital video camera. If you spend $2 million now and $2 million next year, then in 2 years you will have a prototype based on new technology. You will then learn whether its performance is superior to existing technology, about the same, or inferior. The probability of superior technology is 25%, the probability that performance is about the same is 45%, and the probability of inferior performance is 30%.

You can then decide whether to abandon the project (in which case no further cashflows occur), or to invest $10 million in a production facility to manufacture a high-quality camera, or to invest $7 million in a production facility to manufacture a low-quality camera. If you go ahead and invest, you will then receive equal cashflows from producing the camera at the end of each of the next 4 years.

If the technology is superior, the cashflow per year from producing the high-end camera would be $6 million, and for the low-end camera it would be $4 million. If the technology is about the same as existing technology, the cashflow per year from producing the high-end camera would be $4 million, and for the low-end camera it would be $3.5 million. If the technology is inferior, the cashflow per year from producing the high-end camera would be $1.5 million, and for the low-end camera it would be $2 million.
The discount rate is 12%. Should you develop the new camera or not?

2. Consider the oil well example we discussed in class. Now assume that the test for oil is not perfect but instead has a false positive and a false negative probability of p. That is, the probability of the oil field being rich given a positive test result is $1-p$. Similarly, the probability of the oil field being poor given a negative test result is $1-p$. How bad can the test be (i.e., how big can p be) such that you'd still want to test before deciding whether to drill or not?

3. You own an unused silver mine in Colorado that will cost $2m to reopen. If you open the mine you expect to be able to extract 4000 ounces of silver a year for each of three years. After that the deposit will be exhausted. The silver price for the first year is $250/oz. and each year the silver price is equally likely to rise or fall by $25 from its level in the previous year. The extraction cost is $230/oz and the discount rate is 10%. Assume costs and revenues occur at the end of each year.
a) Should you open the mine now?
b) What if you could costlessly (but irreversibly) shut down the mine at any stage? Would you open the mine? When would you want to make use of this option?