Homework 2

Due Tuesday February 23, 2016

Economics of Sustainability

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You are encouraged to form study groups to work on these problems. However each student must hand in a separate assignment: the group can work together to discuss the papers and comment on drafts, but each study group member must write it up herself/himself. Please submit homework assignments on Blackboard.

1. What are the names of people in your study group?
2. Consider some discount rate calculations. You can pick your annualizing frequency but be consistent so that you can compare answers.
    a. If the interest rate is 3%, what is the discounted value of $1000 in 10 years?
    b. If the interest rate is 1%, what is the discounted value of $1000 in 10 years?
    c. If the interest rate is 5%, what is the discounted value of $1000 in 10 years?
    d. Suppose you are uncertain what interest rate to use, whether 1%, 3%, or 5%. What is the average present discounted value of your calculations? What if you used the average interest rate to do a single discount calculation? Can you figure out the interest rate implied by averaging the discounted values?
    e. At a discount rate of 2%, what is the present value of 3 payments made in 10, 12, and 15 years in the future, each of $1000?
    f. Can calculate effect of changing interest rates.
        i. What is discounted value, as of 10 years in the future, of $1000 paid 20 years in the future, when the interest rate between 10 and 20 years is 2%?
        ii. What is discounted value of the answer from part (i), at interest rate of 3%, today?
    g. Consider a case where we use (something like) hyperbolic discounting. To value $1m paid in each of the next 100 years *[really, you'll want to use a spreadsheet or something!]*, we use a discount rate of 0.5% from years 50-100, a discount rate of 1% for years 25-49, and a discount rate of 2% for years up to 25. What is the discounted value? What would be the discounted value at a flat rate of 1%?
3. Suppose a possible gas well site, currently untapped, could produce gas sufficient to turn a profit of $1m in 6 years. How much is the site worth now, if the discount rate were 8%? If the discount rate were 12% because of a greater riskiness? If there is a 50% chance that the rate is 8%, and a 50% chance that the rate is 12%, what is the well worth? What interest rate would give the same value? *(This ignores the uncertainty in gas prices over that time horizon. Assume these are hedged; we'll discuss those possibilities later.)*