

IEMS 326, Homework 1, Due 1/12/2011

Please see the homework policies in the syllabus, especially about charts and spreadsheets.

1. (Simple Calculations)

- a) What is the present value of \$3.26 invested 65 years ago at 4% interest?
- b) Newnan et al. chapter 5 problem 2.
- c) Newnan et al. chapter 5 problem 4 with an interest rate of 7%.

2. (A lottery prize) Suppose you win the lottery grand prize of \$50 million. However you do not get this prize money immediately. You have the alternative of either receiving half immediately or the full amount paid in 20 equal installments, one per year, with the first installment being paid immediately. Produce a chart showing the present value (y-axis) of both alternatives (i.e., use two lines) as you vary the discount rate (x-axis). *Do not show your work for this problem.*

3. Modify the social security spreadsheet to answer the following questions. *Do not show your work and do not turn in the spreadsheet.*

- a) Produce a chart showing how the 2050 trust fund balance (y-axis) changes with the real rate of return (x-axis). At what real rate of return is the 2050 balance zero?
- b) Suppose that the current recession temporarily reduces the labor force participation among 18-64 to 65%. What is the effect on the year at which the trust fund becomes negative if the labor force participation rate recovers in 2011 (to its baseline value of 76.7%)? What if it remains depressed at 65% until 2014 and only recovers in 2015?
- c) Suppose the tax rate is reduced by 100 basis points¹ in 2010-2012 (to stimulate the economy). What is the effect on the 2050 balance of the trust fund?
- d) Write up to 250 words explaining which factors have the greatest influence on the solvency of the trust fund.

4. (Saving for college tuition) Suppose that on 9/1/2014, you and your significant other have a child. You plan to open a 529 account at that point to save for the child's future college expenses. The total cost of attending Northwestern for the 2010-2011 academic year is \$56,006. Assume that this cost will increase by 4% annually. You plan to put money into the 529 account each year starting from the child's birth to their 18th birthday, at which point they start college. Each year you will increase your contribution by 2% (as you get raises at your job). Assume that the investment return of the account is 3% annually; that expenses fall at the beginning of the academic year (September 1st), and that your child will graduate in 4 years. How much should be in the 529 account when your child starts college (just after you make the contribution on their 18th birthday)? How large should your first contribution be (on the child's day of birth)? *Build a spreadsheet and highlight your answers.*

¹ A basis point is 1/100th of a percent, or 0.0001. For example, adding 100 basis points to a tax rate of 12.4% means increasing the tax rate to 13.4%. This terminology helps us to be more precise: if I said, increase the tax rate by 1%, you might wonder whether I meant $12.4\% + 1\% = 13.4\%$ or $12.4\% * (1.01) \approx 12.5\%$.