IEMS 326 Midterm

2/11/2009

Solutions are due by 4am on Thursday morning in my email inbox. State your final answers in the email body and include as an attachment a document (such as a spreadsheet) showing your work. This document should show your work in a clear and organized fashion, and its file name should be your last name.

You may use your notes, Excel, your book, and material posted on the course website. You may not communicate with other people (except with me) about the exam.

1) Calculate the NPV of 36, $700/mo. payments, with the first payment being 1 month from today at a 10% APR compounded monthly.

2) Calculate the NPV of monthly $700 payments, at 6% APR compounded monthly, with the first payment being today and the last payment being 5 years from today.

3) You have $3000 in credit card debt and you want to pay it off in a year (the first payment is due in a month and the last is due in a year). How large must the monthly payment be at 17% APR compounded monthly?

4) You have $3000 in credit card debt at 23% APR compounded monthly and you want to pay it off (the first payment is due in a month). How many payments will you need to make if you pay $50/mo.? if you want to pay $100/mo.?

5) Calculate the APY of a saving account paying (i) 2.42% compounded monthly, (ii) 2.23% compounded daily, and (iii) 2.3% compounded yearly. Which is the best investment? If you invest $10k in each account, what's the difference between the best and worst investment after 1 year?

6) The remaining balance on your current mortgage is $100k. You want to refinance it with a new 30 year fixed-rate loan. You have two options, (i) 5.375% APR with $1500 in fees up front and (ii) 5% APR with $4000 in fees up front. Interest is compounded monthly, and the fees just increase the size of the loan. What are the monthly payments of each choice? Which is lower?

7) Utilities measure cold weather in units of heating degree days (HDD). A day with whose average temperature is X degrees Fahrenheit counts for 0 HDD if $X \geq 68$ (i.e., if the average temperature is at or above 68° F). If on the other hand $X < 68$, then it counts as $68 - X$ HDD. For example, if the average temperature is 25° F, then it counts as 68-25=43 HDD (heating degree days). If you have a week where the average temperature is 25° F each day, then it counts as $43 \cdot 7 = 301$ HDD. Suppose that the change in average temperature from one day to the next is random, independent, and normally distributed as $\mathcal{N}(0,4)$ with mean 0 and variance 4. Calculate the expected number of HDD over a 7-day period, to within 3 HDD, if the average temperature on the first day is 10 F? if the average temperature on the first day is 70 F?