Problem Set #5
Due March 27, 2000

1. Lee is tired of sitting in the cold (but refreshing) Michigan winter drafts and is considering insulating his home. It would cost him $5000 this year to insulate (he's got a big house), and the estimated reduction in his yearly fuel costs at this year's prices would be $350. The insulation can be installed immediately, so that he saves this amount on fuel even in the current year. Assume that the nominal interest rate is 9% a year and that the rate of inflation is 2% a year on everything, including fuel unless specified otherwise. Lee plans to live in the house until he retires, 23 years from today, at which point he will sell the house and move to someplace warmer. He has already consulted a real estate agent for advice and was told that insulation will not add anything at all to the value of the house when it is sold.

   (a) What is the net present value of insulating Lee's humble abode? Should Lee insulate?

   (b) If fuel prices were expected to rise at a rate of 5% per year instead of the 2% rate of the general price level, what would be the net present value of Lee's insulation project? Should Lee insulate in this case?

   (c) Suppose that the real estate agent is wrong, and that insulation does, after all, add to the value of a house when it is sold, adding the (then) present discounted value of the cost savings over all later times. The price of Lee's house today (without insulation) is $600,000. Assume as in part (a) that heating oil prices are constant in real terms.

      i) At today's prices, what will Lee's house be worth 23 years from today if he insulates it?

      ii) What is the net present value today of insulating Lee's house today, allowing both for Lee's own cost saving as in part (a) and for the increased value of the house when he sells it.

      iii) Should Lee insulate in this case?

   d) Calculate the present value of insulating Lee's house if he were to decide never to sell it at all, but rather to keep it for himself and for his descendants forever. How does your answer compare to your answer in part (c-ii), and why?

2. You are currently 40 years old (imagine that!) and you expect to work another 25 years before retirement. In your job as a public policy analyst, you are earning $40,000 a year and, unless you take steps to change that, you expect to continue earning that same amount in real terms for the rest of your working career. This is a problem, because while you do have a little savings put aside – just $5,000 in a savings account earning 5% a year nominal interest – you also owe $23,000 on credit cards

(you have great credit, as a policy analyst) on which you are paying 18% a year nominal interest. The rate of inflation is just 2%.

a) Your boss suggests the following option: take a course in benefit-cost analysis at the SPP (you didn't learn it the first time), and she will raise your pay to $45,000 a year. The course will cost you $5,000 tuition up front, plus you will have to miss work without pay for 6 months starting 6 months from now. Your salary would go up starting a year from now.

   i) What is the present value to you of the increased pay you will get from this?

   ii) What is the present value of the cost to you of taking the course?

   iii) What, then, is the present value of taking the course *and* getting the raise?

   iv) Should you take the course or not? Write a one-paragraph, non-technical explanation of your decision for your spouse, who is not an economist.

b) Your doctor just told you that you have an incurable disease and have only 5 years to live. During this time the disease will not interfere with your performance as a policy analyst, but at the end of 5 years exactly you will surely die. Which of your answers in part (a) are changed by this news?

c) Your lawyer just told you that your doctor faked his diploma from medical school, and you decide that there is a 70% chance that the doctor is wrong and you will live past retirement after all. What is now the present discounted *expected value* of taking the course and getting the raise?

d) Doing your best to imagine yourself in the situation of part (c), tell us what you think would be the certainty equivalent for you personally of the course/raise. This is subjective, and there is no *correct* answer, but you should explain why your answer is higher, lower, or equal to the expected value from part (c).

e) Terribly sorry, but your boss just learned about the disease and withdrew the offer. (Don't hold it against her – she just did it in order to get you back to the $40,000 salary as a starting point for this next part of the question.) But not to worry: you've also just learned from your brother-in-law about a drug that he can get for you that will help, called Extendo. If you take it every day from now on, it will stop the progression of the disease. That is, if you do have the disease, then each day that you take Extendo will delay your death from the disease by one day. How much would you be willing to pay each year for this drug, assuming that you believe that it will work? Again, there is no correct answer to this; it is subjective. But see if you can provide some explanation for the number that you give.