

Midterm 2 (100 points)

1. (12 points) Suppose your apartment rent is currently \$700/mo. and will increase with inflation. How much do you expect the apartment rent to be in 3 years assuming a 2% annual rate of inflation.

2. (24 points) After you become rich, you are thinking of setting up an endowment to purchase laptops for all undergraduates, forever. (You start by buying laptops for all current students, and when students graduate they turn their laptop back into the school so that it can be used for new students.) You can either buy PC laptops which last 3 years or Mac laptops which last 4 years. Suppose the current prices are \$900 for a PC laptop and \$1100 for a Mac laptop. You expect laptop prices to decrease 2% a year and your endowment to obtain a 7% investment return a year. Which type of laptop should you choose? How big of endowment would you need for a student body of 5000 students?

3. (32 points) You just sold your first startup and are thinking of buying a \$300k condo with cash in order to rent it out. Taxes, maintenance, and condo fees total \$2000 a year. Assume a 3% annual rate of inflation and a 6% nominal discount rate a year. Assume that the rent, taxes, maintenance, and condo fees are collected annually at the end of each year and increase with inflation. What is the break-even annual rent (in today's dollars)? What is the break-even rent (in today's dollars) if you can buy the condo with a 30-year mortgage with 20% down at 3.5%? Assume for simplicity that the mortgage has annual payments and the interest is compounded annually.

4. You work for an oil company which has discovered a large new oil field. Your job is to decide whether to develop the field, and if so, which of two alternative oil rigs to use to pump the oil. The main source of uncertainty is the amount of oil in the field. With probability 20%, this is 6 million barrels, with probability 50%, it is 10 million, and with probability 30%, it is 20 million. You must pay for the rig now and production will begin in Year 1 and last until the field is exhausted. Rig A costs \$50 million while Rig B costs \$150 million, but it allows you to pump oil faster. The following table shows what your annual cashflow would be in each scenario and with each rig, and the duration i.e. how many years that annual cashflow would last.

	Rig A			Rig B		
	Scenario			Scenario		
Probability	20%	50%	30%	20%	50%	30%
Cashflow (\$m)	34	34	34	71	71	71
Duration	6	10	20	3	5	10

The discount rate is 10% annually. (Hint: ignore taxes and anything else not mentioned.)

- a) (16 points) Suppose you have no way of resolving your uncertainty about the size of the field before making a decision. **Should you install Rig A, Rig B, or neither?**

- b) (16 points) Now suppose that you can do further testing in order to reveal the exact size of the oil field, i.e. find out what scenario is true before installing a rig. This test

would not delay installation of the rig or the beginning of production, but it would cost money. In each scenario of oil field size, once you have done the test and know the size, would you develop the field, and which rig would you install? **What is the value to you of doing the test?** Draw the decision tree. Solve it, and then write a sentence or two giving the optimal decision and the value of the test.