

SUNY-Stony Brook. Economics Department
Economics 323: Fall 2011
Professor Hugo Benítez-Silva

Problem Set 1: Due Tuesday September 20, 2011 in class

Please in your answers always show your work. Otherwise your grade will suffer considerably. There are 6 sections.

1.Let's start kind of easy (10%):

- a) How much is \$1 Million to be delivered 20 years in the future worth today if the interest rate is 20%?
- b) Would the assumption that goods are perfect substitutes be valid in a study of inter-temporal food purchases?
- c) What is the present value of \$100 one year from now if the interest rate is 10%? What is the PV if the interest rate is 5%?

2.Truth does matter! (Justify your answers). (10%)

- a) If the real interest rate is positive, then a unit of future consumption can be had for the sacrifice of less than one unit of current consumption. **True or False**

- b) An increase in the interest rate will necessarily result in a decrease in the present value of a given stream of positive incomes. **True or False.**

- c) If apples today are perfect substitutes for bananas today, then apples today must also be perfect substitutes for bananas tomorrow. **True or False.**

3. Multiple Choice (10%)

A) Harvey has a utility function $U(c_1, c_2) = \min\{c_1, c_2\}$ where c_1 and c_2 are his consumption in periods 1 and 2 respectively. Harvey earns \$180 in period 1 and he will earn \$66 in period 2. Harvey can borrow or lend at an interest rate of 10%. There is no inflation. What will Harvey do?

- a) Harvey will save 60
- b) Harvey will borrow 60
- c) Harvey will neither borrow nor lend
- d) Harvey will save 54.28.
- e) I do not know Harvey, and quite frankly I do not care much for his problems. Furthermore, that utility function is just odd.

B) If a consumer views a unit of consumption in period 1 as a perfect substitute for a unit of consumption in period 2 and if the real interest rate is positive, the consumer will:

- a) Consume only in period 1.
- b) Consume only in period 2.
- c) Consume equal amounts in each period.
- d) Consume more in period 1 than in period 2 if income elasticity exceeds 1, else would consume more in period 2 than in period 1.
- e) Equalize expenditures but not consumption in the two periods.

C) Think of a consumer that only values consumption in periods 1 and 2. She discounts the period 2 consumption by a factor $\beta < 1$, and $\beta < (1/(1+r))$

- a) She will only consume in period 1
- b) She will only consume in period 2
- c) Consume more in period 2 than period 1
- d) None of the above

4. More Multiple Choices (sometimes using Excel will be convenient) (30%)

- 1.** Approximately how many years must one wait for an initial investment of \$10000 to triple in value if the investment earns 9% compounded annually?
A. 19 B. 17 C. 15 D. 13
- 2.** What is the present value of the following payment stream at an interest rate of 7%; \$1000 today, \$2000 at the end of year 1, \$5000 at the end of year 3, \$6000 at the end of year 5
A. \$11,243 B. \$10,652 C. \$11,229 D. \$10,034
- 3.** \$10,000 borrowed at 8% is to be repaid in four equal annual payments. How much of the principal is amortized with the first payment?
A. \$2481 B. \$2316 C. \$2219 D. \$2187
- 4.** Your 401K's balance is \$50,000 right now. You want to retire in 30 years with \$1,000,000. You add \$6000 annually, but what interest rate do you need to earn in order to reach your goal?
A. 9.37% B. 8.12% C. 15.76% D. 6.52%
- 5.** What is the NPV of a project that costs \$50,000 and returns \$30,000 annually for three years if the opportunity cost of capital is 12%?
A. \$12,047.88 B. \$16,887.97 C. \$22,054.94 D. \$25,374.23
- 6.** What is the IRR of a project that costs \$74,361.78 and provides cash inflows of \$25,000 annually for four years?
A. 9.85% B. 11.02% C. 13% D. 14.85%
- 7.** If a project requires an initial investment of \$30,000 and returns \$7500 annually for four years, then what can be assumed about the NPV?
A. The NPV is positive; B. The NPV is negative for any interest rate; C. The NPV is zero; D. Nothing can be assumed about the NPV.
- 8.** A currently used machine costs \$7750 annually to run. What is the maximum that should be paid to replace the machine with one that will last four years and cost \$3575 annually to operate? The opportunity cost of capital is 15%.
A. \$10,000.00 B. \$11,919.53 C. \$11,943.45 D. \$12,348.54

5. More about Harvey (15%)

Harvey Habit's utility function is still $U(c_1, c_2) = \min\{c_1, c_2\}$, where the arguments are the consumption in period 1 and consumption in period 2. The price of bread is \$1 per loaf in period 1. The interest rate is 21%. Harvey earns \$2000 in period 1 and he will earn \$1,100 in period 2

- a) Write Harvey's budget constraint in terms of future value, assuming no inflation.
- b) How much bread does Harvey consume in the first period and how much money does he save? (the answer might not be an integer)
- c) Suppose that Harvey's money income in both periods is the same as before, the interest rate is still 21%, but there is a 10% inflation rate. How much would a loaf of bread cost in period 2? Write down Harvey's budget equation for period-1 and period-2 bread, given this new information.

6. New Mall (25%)

In recitation you will soon start to work on the spreadsheet showing the alternative options that New Mall LLP has. Understanding why this problem is useful requires your attention to detail. This is an example of a real investment decision, and real life is complex. In this exercise you will be asked to pay attention to just about every number and be critical about what it means and how you use it, and how using the tools we have talked about in class requires more than just mechanical calculations.

a) How do the NPV and the IRR calculations change with the interest rate? If interest rates go up, say by 2 percentage points, what happens?

b) As we discussed in class and in recitation, almost every time the NPV or IRR approach is used to evaluate projects the assumption of perfect foresight (the analyst knows everything about the future of the project) is used. Imagine for a moment you are presenting this project to a bank officer who will decide whether they give you the \$100k or so, which any of these projects will cost. The loan officer will make a recommendation to the risks committee who will then approve your loan or not.

The main concern of the loan officer is related to the occupancy rates. He wants to know how sensitive your NPV and IRR calculations are to the assumptions regarding occupancy rates, especially of the commercial space.

There are many ways to approach answering the loan officer's concerns. One I suggest is to work out scenarios of different occupancy levels and seeing the effect on NPV and IRR calculations. Notice, however, that lower occupancy rates not only affect revenues but could also affect costs, since the marketing costs (now buried under miscellaneous) might go up considerably so you can try to rent more space. For example, the current occupancy numbers might be rather optimistic. Can you assign a probability to these numbers and another one to less optimistic numbers? How does the NPV change?

c) Having 72 different tenants can be quite a costly operation, especially because the numbers in the spreadsheet assume yearly contract renovations. On top of that, there is some probability that one of these businesses will face financial hardship, affecting your occupancy rates, or your ability to collect the estimated rent income. In this section you have to read the article I will distribute about the big chains of retailers trying to establish themselves around Long Island. Imagine one of these chains (Target, Wal-Mart, Home Depot, etc...) shows interest in the mini-mall you are considering. They essentially offer you to rent the whole property, but they do not want to pay the price per squared meter of commercial real estate that you were planning to charge the small renters. In a traditional NPV calculation that is difficult to reconcile, so you have to be inventive and think about how you can take into account the lower risk and possibly lower costs that renting the whole space to one retailer will have for the business. What would you say the minimum NPV would be to accept the big-box retailer's offer? You have to justify your answer. It is less about the number and more about the reasoning. Can you use the interest rate as a way of considering differences in risks?