

MIT SLOAN SCHOOL OF MANAGEMENT

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Problem Set 1: Present Value

Due: September 23, 2003

1. (BM) A factory costs \$800,000. You reckon that it will produce an inflow after operating costs of \$170,000 a year for 10 years. The opportunity cost of capital is 14%,
 - (a) what is the NPV of the factory?
 - (b) What will the factory be worth at the end of five years?
2. (BM) Siegfried Basset is 65 years of age and has a life expectancy of 12 years. He wishes to invest \$20,000 in an annuity that will make a level payment at the end of each of the next 12 years. If the interest rate is 8%, what income can Mr. Basset expect to receive each year?
3. (BM) An oil well now produces 100,000 barrels per year. The well will produce for 18 years more, but production will decline by 4% per year. Oil prices, however, will increase by 2% per year. The discount rate is 8%. What is the PV of the well's production if today's price of oil is \$14 per barrel?
4. Sam is a manager who earns \$50,000 this year. He expects his wage to increase by 4% each year. He plans to retire in 20 years, and he wishes to accumulate \$300,000, in real terms, when he retires. Assuming interest rate is 5% and inflation is 2%, calculate:
 - (a) The amount he needs to save if he wishes to save a constant dollar amount for the next 20 years.
 - (b) The fraction of income he needs to save if he saves a constant fraction of his income each year.

Ignore the effect of all taxes.

5. 10 years ago, you entered into a mortgage agreement to borrow \$200,000, at an interest rate of 10%, to be returned in 30 years. However, interest rates fell and the on-going mortgage rate is just 6%. You pay a constant amount at the end of each year, partly to cover the interest and the rest to pay back the principle.
 - (a) How much are you paying the bank per year?
 - (b) Right now, how much principle do you still owe the bank?
 - (c) What is the PV of the mortgage you owe to the bank?

- (d) The bank allows you to re-finance your mortgage at the current rate of 6%. However, the bank requires you to pay the bank an additional 10% of the principle you still owe to the bank. Will you do the re-financing?
6. You can invest \$20 into a project that pays you \$1 at the end of 1 year, \$2 at the end of two years, etc., until paying \$10 at the end of 10 years.
- (a) Calculate the IRR of the project.
- (b) The opportunity cost of the project is 15%. Is this an attractive project? Briefly explain.
7. USD interest rate is 3% and British Pound interest rate is 6%. The current exchange rate is 1.5 USD per pound.

You are offered a contract that allows you to buy 100,000 British pound with \$140,000 USD at the end of 3 years. Is this a worthwhile investment? Explain.