FIN2010 Problem Set 1

1. Suppose you took a $100,000 30 year fixed-rate mortgage at 5% (APR) 3 years ago. Now the market interest rate has dropped to 4.5%, and you are considering refinance your mortgage. Hint: refinancing means that you take out a new loan and pay off the old loan.

   (1) What was the original monthly payment?

   (2) Suppose you just made the 36th monthly payments. What is the remaining mortgage balance?

   (3) If you refinance the mortgage with another bank and keep the remaining term until the mortgage is paid off (that is, you take a 27 – year loan, and the loan amount is the one you calculated in question (2)), what would the new monthly payment be?

2. A foundation announces that it will be offering one CUHK (SZ) scholarship every year for an indefinite number of years. The first scholarship is to be offered exactly one year from now. When the scholarship is offered, the student will receive ￥100,000 annually for a period of four years, beginning from the date the scholarship is offered. This student is then expected to repay the principal amount received (￥400,000) in 10 equal annual installments, interest-free, starting two years after the last payment of the scholarship. This implies that the foundation is really giving an interest-free loan under the guise of a scholarship.

   (1) What is the NPV of the first scholarship for the recipient? Use an interest rate of 4%. (The scholarship includes both money given out to and the repayments received from the students.)

   (2) The foundation invests a lump sum to fund all future scholarships. Determine the size of the investment today. Use an interest rate of 4%.

3. The annual membership fee at your health club is $650 a year and is expected to increase at 4% per year. A life membership is $6,500. You can either pay the annual membership each year or pay the life membership right now. In order to justify taking out the life membership, what would be your minimum life expectancy? Use a discount rate of 10%.

4. You are considering buying a car worth $20,000. The dealer, who is anxious to sell the car, offers you an attractive financing package. You have to make a down-payment of $3,000, and pay the rest over 3 years with monthly payments. The dealer will charge you interest at a constant APR of 3%, which is lower than the market interest rate.

   (1) What is the monthly payment to the dealer?

(2) The dealer offers you a second option: you pay cash, but get a $2,000 discount. Should you go for the loan or should you pay cash? Assume that the market annual interest rate (APR) is at 5%. That is, you will use 5% to find the PV of each payment methods and choose the one with a lower PV.

5. Your cousin is entering medical school next fall and asks you for financial help. He needs $60,000 each year for the first two years. After that, he is in residency for two years and will be able to pay you back $10,000 each year. Then he graduates and becomes a fully qualified doctor, and will be able to pay you $50,000 each year. He promises to pay you $50,000 for 5 years after he graduates. Are you taking a financial loss or gain by helping him out? Assume that the interest rate is 4% and that there is no risk of him breaking his promise.

6. Currently a 30-year Treasury bond with 5% semiannual coupon is traded at a yield of 6% (APR).

   (1) Is the price above or below 100?

   (2) Calculate the current price of the bond.

   (3) If the yield increased by 0.1% (that is, the yield increases to 6.1%), how much would the price change? Would the price increase or decrease?