ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Principles of Finance

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Assignment 1

Instructions

- Assignments should be done in groups of 3 students.
- You should remain with the same group through the entire course.
- Submit on Moodle only one copy of solutions per group.
- For each assignment you can get a maximum of 100 points.
- All assignments turned in late will not be graded (zero points).

Due date

The due date is indicated on Moodle.

1. A project you are considering is expected to provide benefits worth \$14,500 in two years and \$17,500 in five years. If the relevant discount rate is 7.5%, what is the value of the benefits of this project today? (5 points)

2. An investment opportunity pays off \$5,000 at the end of each of the next five years. This opportunity requires an initial investment of \$3,500 plus three additional investments at the end of the second, third and fourth year of \$7,000. If the interest rate is 5.5% per year, what is the present value of the costs of this investment? Should you undertake it? (5 points)

3. You are a Swiss investor. Suppose the bank offers you a three year forward exchange rate of $1.08 to CHF 1. You have an investment opportunity in the US that requires an investment of CHF 350,000 today and will produce a cash flow of $420,000 in three years with no risk. Should you invest in this opportunity if the risk free rate of interest in the US is 3%? (5 points)

4. Use the information in the table below to answer this question.

Security	Cash flow today	Cash flow in one year
A	0	100
B	100	0
C	100	100

   If the prices at which securities C and A are trading are $180 and $80 respectively, is there an arbitrage opportunity? What should you do? Explain. (10 points)

5. Use the information in the table below to answer this question.

Year	A	B
0	-100	-1000
1	45	500
2	75	600
3	-10	-70

   If the interest rate is 3%, which investment(s), if any, would you take and why? (5 points)

6. You have a loan outstanding which requires making four annual payments of $1,200 at the end of the next four years. You have received an offer from your bank to make one large payment at the end of loan's term in four years in lieu of the initial three payments. If the interest rate on the loan is 6.5% what is the maximum final payment you accept to pay instead of your three next payments? (5 points)

7. Your parents put some money in an account for you on the day you were born. You are now 18 years old and are allowed to withdraw the money for the first time. The account currently has $21,000 in it and has been paying and will also continue to pay an interest rate of 5%. Answer the following questions: (10 points)

   - How much money would be in the account if you left the money there until your 35th birthday?
   - How much money did your parents originally put in the account?

8. Suppose that a young couple wants to send their daughter to private school. Tuition is $15,000 per year, payable at the *beginning* of the school year. The couple would like to keep their daughter in private school through high school (i.e. 12 years of schooling). You expect tuition to increase at a rate of 6% per year. Suppose the daughter starts going to school today. How much would the couple need to have in their bank account now to fund all 12 years of tuition if the interest rate is 6%? (10 points)

9. You are thinking of buying a new machine that will save you $2,000 in the first year. The machine will then begin to wear out so that the savings decline at a rate of 4% per year forever. Assume the savings occur at the end of each year. What is the present value of your savings if the interest rate is 2% per year? (10 points)

10. You would like to purchase a house that costs $550,000. You have $150,000 in cash and you need to borrow the rest of the purchase price. Your bank is offering a 25-year mortgage that requires annual payments and has an interest rate of 9% per year. Given this information, answer the following questions: (10 points)

    - What will your annual payment be if you sign up for this mortgage?
    - You can only afford to pay $38,000 per year. Your bank agrees to lend you the $400,000 and pay what you can afford each year, but requires you to make a balloon payment at the end of your mortgage (in 25 years); that is you must repay the remaining balance on the mortgage. How much will this balloon payment be?

11. You are saving for retirement. To live comfortably, you decide you will need to save $2.5 million by the time you are 66. Today is your 28th birthday and you decide, starting *today* and continuing on every birthday up to and including your 66th birthday, that you will put some amount of money into a saving account. Since your income will increase over your lifetime, you decide to let the amount that you set aside grow by 2.5% per year. If the interest rate is 3.5% how much will you put in your account today to make sure that you will have $2.5 million in the account on your 66th birthday? (15 points)

12. Your grandmother paid $250,000 for an annuity when she retired. In exchange for the $250,000, she will be paid $30,000 per year until she dies. The interest rate is 6%. How long must she live after the day she retired to come out ahead (that is, to get more in value than what paid in)? (10 points)