**ECO138(3) Homework Questions for Chapter 10 " Interest Rates and Present Values"**

Section 10.1
1. What will be the size of an account after 5 years if $8000 is invested at an annual interest rate of 5% compounded (i) monthly, (ii) daily (with 365 days in a year)?

4. An amount of 2000 Euros is invested at 7% per year. What is the balance in the account after (i) 2 years, (ii) 10 years?

5. Calculate the effective yearly interest if the nominal rate is 17% and interest is added: (i) biannually, (ii) quarterly and (iii) monthly.

6. Which terms are preferable for a borrower: (i) an annual interest rate of 21.5%, with interest paid yearly, or (ii) an annual interest rate of 20%, with interest paid quarterly?

7. (a) The sum of $12000 is invested at 4% annual interest. What will this amount have grown to after 15 years?

(b) How much should you have deposited in a bank account 5 years ago in order to have $50000 today, given that the interest rate has been 5% per year over the period?

(c) A credit card is offered with interest on the outstanding balance charged at 2% per month. What is the effective annual rate of interest?

Section 10.2.
1. (a) How much does $8000 grow to after 5 years if the annual interest rate is 5%, with continuous compounding?
(b) How long does it take before the $8000 has doubled?

2. An amount $1000 earns interest at 5% per year. What will this amount have grown to after (a) 10 years, and (b) 50 years, when interest is compounded (i) yearly, or (ii) monthly, or (iii) continuously?

3. (a) Find the effective rate corresponding to an annual rate of 10% compounded continuously.

(b) what is the maximum amount of compound interest that can be earned at an annual rate of 10%?

Section 10.3.

1. Find the present value of 350000 which is due after 10 years if the interest rate is 8% per year (i) compounded annually, or (ii) compounded continuously.

Section 10.4.

1. Find the sum $s_n$ of the following finite geometric series

$$1 + \frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} \ldots + \frac{1}{3^{n-1}}$$

When n approaches infinity, what is the limit of $s_n$? Find the sum $\sum_{n=1}^{\infty}(\frac{1}{3^{n-1}})$.

2. Find the sums of the following geometric series:

(b) $(0.1) + (0.1)^2 + (0.1)^3 + \cdots\cdots$

(c) $517 + 517(1.1)^{-1} + 517(1.1)^{-2} + \cdots\cdots$

7. The world's total consumption of natural gas was 1824 million tons oil equivalent (mtoe) in 1994. The reserves at the end of that year were estimated to be 128300 mtoe. If consumption had increased by 2% in each of the coming years, and no new sources were ever discovered, how much longer would these reserves have lasted?

Section 10.5.
1. What is the present value of 15 annual deposits of $3500 if the first deposit is after on year and the annual interest rate is 12%?
3. Suppose you are given the following options:

(i) $13000 paid after 10 years, or

(ii) $1000 paid each year for 10 years, first payment today.

Which of these alternatives would you choose, if the annual interest rate is 6% per year for the whole period?

4. An author is to be paid a royalty for a book. Two alternative offers are made:

(a) The author can be paid $21000 immediately.

(b) There can be 5 equal annual payments of $4600, the first being paid at once.

Which of these offers will be more valuable if the interest rate is 6% per annum?

8. Find the present and future values of a constant income stream of $500 per year over the next 15 years, assuming an interest rate of $r = 6\% = 0.06$ annually, compounded continuously.

Section 10.7.

1. An investment project has an initial outlay of $50000 and at the end of each of the next two years has returns of $30000. Find the associated internal rate of return r.

6. A is obliged to pay B $1000 yearly for 5 years, the first payment in 1 year's time. B sells this claim to C for $4340 in cash. Find an equation that determines the rate of return p that C obtains from this investment. Prove that it is a little less than 5%.