Indian Institute of Technology Jodhpur

Financial Engineering

Trimester III (2020-21)

Assignment I (Practice Assignment)

1. How long does it take to double your capital if you put it in an account paying compound interest at a rate 7.5%? What if the amount pays simple interest?

2. Suppose that an account offers a nominal interest rate of 8% per annum payable quarterly. What is effective rate? What if the nominal rate is the same, but the interest is payable monthly? Weekly? Daily? Continuously?

3. Compare the following three loans - a loan charging an annual effective rate of 9%, a loan charging 8.75% compounded quarterly, and a loan charging 8.5% payable in advance and convertible monthly.

4. An investor is considering two projects -

    (i) First project requires an investment of Rs 100000 now. In return, the investor will receive six annual installments of Rs 21000, begining one year after the investment.

    (ii) Second project requires an investment of Rs 100000 now and another investment of Rs 20000 one year later. In return the investor will receive Rs 85000 after 4 years from now and another 85000 after 7 years from now.

    Compute the net present value of both the investments, assuming the interest rate 4%. Which one is better investment?

5. You want to endow a fund which pays out Rs 1000 every year in perpetuity. The first installment will be paid out to you in five years' time. Assuming an interest rate of 7%, how much do you need to pay into the fund?

6. Consider an annuity of payments at the end of every year. What is the present value of this annuity if it runs for ten years and the interest rate is 7%.

7. An annuity pays Rs 1000 at the end of the first year. The payment increases by 3% per year to compensate for inflation. What is the present value of the annuity on the basis of a rate of 8%, if it runs for 10 years.

8. FInd the price of a five year bond with a face value of Rs 1000 and coupons at 8% per annum payable semi-annually. The yield of the bond is 5%.

9. Suppose that, with probability 0.52, the closing price of a stock is at least as high as the close on the previous day, and that the results for successive days are indepedent. Find the probability that the closing price goes down in each of the next four days, but not on the following day.

10. Starting at some fixed time, let $S(n)$ denote the price of a certain security at the end of $n \geq 1$ additional weeks. A popular for the evolution of these prices assumes that the price ratios $S(n)/S(n-1)$ are iid log-normal random variables with parameters $\mu = 0.0165$ and $\sigma = 0.073$, what is the probability that

   (a) the price of the security increases over each of the next two weeks

   (b) the price at the end of two weeks is higher than it is today

11. Suppose that X has normal distribution with mean μ and variance σ^2, and let $Y = e^X$.

   (a) Determine the density of Y.

   (b) Compute $E(Y)$ and $Var(Y)$.