MATH 2600/STAT 2600, Theory of Interest
FALL 2013
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Midterm Examination
Thursday 17th October: 10:35–11:25 AM

You may use a scientific calculator, but not a programmable or a financial calculator for this examination.

1. Mr and Mrs. Allen are saving up for their children's education. They have two children, aged 9 and 11. They invest $40,000 today at $j_1 = 8\%$ interest, and they want to divide this equally among their two children: when each child is 18 (at exactly this time of year), they will receive their share X. How much does each child get?

2. Which of the following interest rates is best for the borrower?

   (i) 8% compounded quarterly

   (ii) 8.1% compounded annually

   (iii) 8.2% compounded monthly

3. If force of interest is given by $\delta_t = 0.15 + 0.1t - 0.15t^2$ over a one-year period, what is the accumulated value, at the end of the year, of $6,000 invested at the start of the year?

4. The stock of company ABC currently pays a dividend of $0.45 every quarter. Every quarter the company increases the dividend by 0.5%. The current price for the stock (just after a dividend of $0.45 is payed) is $20. What interest rate is being used to value this stock?

5. A company buys a machine for $32,000. The machine is expected to last for 5 years, after which it will have a salvage value of $1,000. Prepare a depreciation schedule using:

   (a) The constant percentage method

   (b) The straight line method

6. A company are deciding between two machines. The first machine costs $100,000, and lasts for 7 years, after which it has a resale value of $6,000, and has maintainance costs of $5,000 every year. The second machine costs $200,000, lasts for 15 years, with a resale value of $25,000, and has maintainance costs of $2,000 every year. If the cost of capital is $j_1 = 6\%$, which machine has lower total capitalised cost?

7. A loan of $100,000 at $j_1 = 6\%$ is amortised with equal annual payments for 4 years.

   (a) Calculate the annual payments.

   (b) Draw up a complete amortisation schedule for the loan.

8. Mr. Brooks buys a house in the US. He needs to borrow \$200,000 at $j_{12} = 6\%$, amortised over 20 years. There is also a financing fee of \$3,000. What is the APR for this loan? [Hint: it is between 6.3% and 6.4%. Give your answer to two decimal places.]

9. Mrs. Carle borrows \$6,000 for one year at 6% simple interest. After 2 months, she repays \$3,000.

   (a) If the loan is calculated using the merchant's rule, how much does she need to pay at the end of the year, to pay off the debt?

   (b) What if the loan is calculated using the US rule?

Formulae

$$s_{\overline{n}|i} = \frac{(1+i)^n - 1}{i}$$

$$a_{\overline{n}|i} = \frac{1 - (1+i)^{-n}}{i}$$

$$(Ia)_{\overline{n}|i} = \frac{(1+i)^{-1}a_{\overline{n}|i} - n(1+i)^{-n}}{i}$$