MATH 2600/STAT 2600, Theory of Interest
FALL 2013
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Homework Sheet 1
Due: Thursday 26th September: 11:30 AM

1. Calculate the accumulated value on maturity of the following investments:

   (a) $7,000 invested for 20 years at 2% effective annual interest.

   (b) $2,000 invested for 7 months at 4% simple interest.

   (c) $3,000 invested for 4 years at $j_4 = 6\%$.

2. Mr. Brown invests $1,000 at 8% effective annual interest.

   (a) How many years does he have to wait before he has saved up $1,800?

   (b) If he needs his investment to grow to $1,800 within 8 years, what rate of interest does he need to invest at?

3. Mrs. Collins takes out a loan for $15,000 at 6% effective annual rate. After 4 years, the interest rate drops to 5%. She repays $7,000 after 6 years, and $2,000 after 7 years. What is the outstanding balance after 8 years?

4. Mr. Donaldson receives an invoice for $1,200, for payment within 40 days. He can get a 3% discount if he pays within the first 10 days. What is the largest rate of simple interest at which it would be worth his taking out a loan to get the discount.

5. Mrs. Erikson buys a promissory note for $8,000 in 200 days at 4% simple interest. After 60 days, she sells it to a bank, which discounts notes at 4% simple interest.

   (a) How much does the bank pay for the note?

   (b) What is Mrs. Erikson's rate of return?

6. Mr. Fox wants to save up $800,000 for his retirement in 14 years time.

   (a) If his effective annual rate of interest is 6%, how much does he need to invest now?

   (b) Suppose he invests this much, but the actual rate of interest he receives is 7%. How much earlier can he retire?

7. What rate of simple discount is equivalent to 9% simple interest over a period of 7 months?

8. What price should you pay for a T-bill of face value $5,000, maturing in 74 days at a simple interest rate of 4%?

9. Mr and Mrs. Graham are saving up for their children's education. They have two children, aged 8 and 12. They invest $80,000 today at $j_{12} = 4\%$ interest, and want to use this to pay $50,000 for each child's education, when the child is 18 (at exactly this time of year). How much money can they take out from this fund in two years time, and still have enough?

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

    (i) 8% compounded quarterly

    (ii) 8.2% compounded annually

    (ii) 7.8% compounded daily

11. What rate of compound interest is equivalent to an 8% rate of compound discount?

12. What rate of continuous compounding (constant force of interest) is equivalent to annual effective rate of 4%?

13. If force of interest is given by $\delta_t = 0.1 - 0.3t + 0.1t^2$ over a two-year period, what is the accumulated value at the end of that period, of $5,000 invested at the start of the period?

14. Mr. Harris wants to buy a house. Today, he would need a downpayment of $150,000 to buy the house, but he only has $90,000. He invests this money at $j_{12} = 7\%$. However, the downpayment needed increases with inflation at a rate of $j_{12} = 6\%$. How long must he wait before he has saved up enough to make the downpayment?