MATH 2600/STAT 2600, Theory of Interest
FALL 2010
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Homework Sheet 5
Model Solutions

1. A loan of \$4,000 at $j_{12} = 8\%$ is amortised with equal monthly payments for 6 months, with the first payment in one month.

   (a) Calculate the monthly payments.

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

2. Mr. Thompson takes out a 25 year mortgage for a loan of \$250,000 at $j_2 = 7\%$. After 5 years, the interest rate increases to 9%.

   (a) Calculate the outstanding balance after 5 years.

   (b) What should the new monthly payments be if he wishes to keep the term of the mortgage at 25 years?

   (c) If instead, he wishes to keep the monthly payments the same (or as near as possible with the mortgage a whole number of years):

   (i) what will the new term of the mortgage be, and what will the monthly payments be?

   (ii) How long must he wait before the payments after the interest rate change have as large a principal component as the last payment before the interest rate change?

3. Mr. and Mrs. Johnson buy a house for \$500,000 with a downpayment of \$100,000 and a 20 year mortgage for the remaining \$400,000 at a rate $j_2 = 6\%$. This results in monthly payments of \$2848.76. The mortgage allows them to pay the balance off early for a penalty of three times the monthly interest on the outstanding balance.

   After 7 years, at what interest rate should they be willing to take out a loan in order to pay off the remaining balance (including the penalty)?

4. Jim takes out a loan for \$15,000, to be repayed over 36 months at $j_{12} = 6\%$. Calculate the outstanding balance after 4 months using:

   (a) The amortisation method.

   (b) The sum-of-digits method.

5. Matthew takes out a mortgage for \$300,000 for 20 years at $j_2 = 6\%$.

   (a) Calculate the monthly repayments.

   (b) The loan is due to be refinanced after 5 years, when Matthew will be allowed to make changes to his monthly payments. The bank charges a penalty of 3 months interest for refinancing before that time. After 1 year,

Matthew gets a promotion, and can now afford payments of up to \$3,000 a month. If he can earn interest of $j_{12} = 3\%$ on his savings, should he refinance the loan early?

6. Mr. Robinson borrows \$1,000,000 at $j_{12} = 9\%$ to set up his business. He has two options for repaying the debt. He may either amortise the debt over 15 years, or he may pay off the interest each month, and set up a sinking fund to pay off the debt at the end of 15 years. The sinking fund will earn $j_{12} = 8.5\%$.

   (a) Calculate the monthly payments needed for each of the options.

   (b) Mr. Robinson expects that he will want to invest a further \$200,000 into his business after 6 years. If he is paying off the loan using a sinking fund, he will just use the money in the sinking fund to pay it off. If he has taken the amortised loan, then he will have to take out another loan at $j_{12} = 12\%$ to make this investment. Calculate the new monthly payments after 6 years in each case.