

EXAM FM QUESTIONS OF THE WEEK

S. Broverman, 2006

Week of October 23/06

An amortized loan of amount L has level monthly payments at the end of each month for n months at an interest rate of j per month. You are given the following outstanding balances on the loan:

- \$2,000,421.83 just after the 40th payment,
- \$1,993,357.51 just after the 41st payment,
- \$1,979,097.21 just after the 43rd payment.

Find the total amount of interest paid over the lifetime of the loan.

The solution can be found below.

Week of October 23/06 - Solution

Principal repaid in the 41st payment is $2,000,421.83 - 1,993,357.51 = 7,064.32$.

Principal repaid in the 42nd and 43rd payments combined is
 $1,993,357.51 - 1,979,097.21 = 14,260.30$.

Since this is a level payment loan, we have

$14,260.30 = PR_{42} + PR_{43} = PR_{41}[(1+j) + (1+j)^2] = 7,064.32[(1+j) + (1+j)^2]$
where j is the one month interest rate.

This gives us a quadratic equation in $1+j$,

$$7,064.32(1+j)^2 + 7,064.32(1+j) - 14,260.30 = 0 .$$

Solving the quadratic equation for $1+j$ results in $j = .00620$.

The level monthly payment is K , where

$$2,000,421.83(1.0062) - K = 1,993,357.51,$$

so $K = 19,466.94$. The number of payments remaining after the 40th payment is n , where
 $2,000,421.83 = 19,466.94a_{\overline{n}|.0062}$, so that $n = 164$. The total number of payments
on the loan is $40 + 164 = 204$. The original loan amount is
 $19,466.94a_{\overline{204}|.0062} = 2,250,000$.

Total interest paid during the loan is $19,466.94(204) - 2,250,000 = 1,721,256$.