

Actuarial Mathematics Homework 14

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MATHEMATICS FOR ACTUARIES TEXTBOOK

(6.2).

- (1) We find $Fr = 1000 * 0.05 = 50$ and i through iteration as $i = 0.061092$
- (2) The redemption amount can be found as

$$\begin{aligned}P &= (Fr)a_{\overline{8}|} + Cv^n \\C &= \frac{P - (Fr)a_{\overline{8}|}}{v^8} \\C &= \frac{2590 - (2500 \cdot 0.065)a_{\overline{8}|}}{v^8} \\C &= 2370.69067\end{aligned}$$

- (3) we find the duration using

$$\begin{aligned}n &= \frac{\ln\left(\frac{P - Fr/i}{C - Fr/i}\right)}{\ln v} \\n &= 42.83510\end{aligned}$$

(4) to find the yield rate and the duration we do the following

$$\begin{aligned}
 & \begin{cases} 2318.63 &= 200a_{\overline{n}|} + 2000v^n \\ 2531.05 &= 220a_{\overline{n}|} + 2000v^n \end{cases} \\
 & 2318.63 = 200a_{\overline{n}|} + 2000v^n \\
 & -(2531.05 = 220a_{\overline{n}|} + 2000v^n) \\
 & 20a_{\overline{n}|} = 212.42 \\
 & a_{\overline{n}|} = \\
 & 2318.63 = 200a_{\overline{n}|} + 2000v^n \\
 & 2318.63 = 200 \cdot a_{\overline{n}|} + 2000v^n \\
 & v^n = 0.097215 \\
 & i = \frac{1 - v^n}{10.621} \\
 & i^{(2)} = (1 + i)^2 - 1 \\
 & \mathbf{i^{(2)} = 0.177225} \\
 & v^n = 0.097215 \\
 & \mathbf{n = 28.5711/2 = 14.28555}
 \end{aligned}$$

(5) if the 12% bond is sold at book value we can do the following

$$\begin{aligned}
 B_{20} &= 3631.7723 = P \\
 F &= \frac{P}{r \cdot a_{\overline{20}|} + v^{20}} \\
 F &= \frac{3631.7723}{0.04 \cdot a_{\overline{20}|} + v^{20}} \\
 F &= 3161.43117
 \end{aligned}$$

(6) Find q

$$\begin{aligned}
 P &= (Fr)a_{\overline{10}|} + (Fq/2)a_{\overline{10}|}v^{10} + Cv^{20} \\
 q &= 2 \frac{P - (Fr)a_{\overline{10}|} - Cv^{20}}{Fa_{\overline{10}|}v^{10}} \\
 q &= 2 \cdot 0.026080 = 0.05216
 \end{aligned}$$

(7) I did not know how to solve this task

(6.3).

(1) Find the price

$$P + 57 = C$$

$$P = (Fr)a_{\overline{12}|0.091} + (P + 57)v^{12}$$

$$P = \frac{(Fr)a_{\overline{12}|0.091} + 57v^{12}}{1 - v^{12}}$$

$$P = 2997.94761$$

(2) find the redemption amount

$$P = C - 83.28$$

$$P = (Fr)a_{\overline{20}|} + Cv^{20}$$

$$C - 83.28 = (Fr)a_{\overline{20}|} + Cv^{20}$$

$$C = \frac{(Fr)a_{\overline{20}|} + 83.28}{1 - v^{20}}$$

$$C = 4438.18330$$

(3) find the monthly deposit

$$Pr = P - C = 1400 - 1100 = 300$$

$$Pr = \ddot{s}_{\overline{10}|0.08} \cdot D$$

$$D = \frac{300}{\ddot{s}_{\overline{10}|0.08}}$$

$$D = 19.17486$$