EXAM MLC QUESTIONS OF THE WEEK

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(x) has the following mortality distribution:

$q_x = .1$, $_{1|}q_x = .2$, $_{2|}q_x = .3$, $_{3|}q_x = .4$.

A 4-year discrete increasing insurance has a death benefit of
$1000(k+1)$ if $K(x) = k$ for $k = 0, 1, 2, 3$.

When the policy is issued with a single premium of 1900, there is a 70%
probability that the issue date loss will be positive. Which of the following annual effective
interest rates are consistent with this probability?

I. 5%   II. 10%   III. 15%   IV. 20%

The solution can be found below.

The issue date losses are

$1000v - 1900$ if $K = 0$ (prob. .1),

$2000v^2 - 1900$ if $K = 1$ (prob. .2),

$3000v^3 - 1900$ if $K = 2$ (prob. .3), and

$4000v^4 - 1900$ if $K = 3$ (prob. .4).

The 70% chance of positive loss indicates that there is a positive loss if $K = 2$ or 3, and a non-positive loss if $K = 0$ or 1.

Therefore the following conditions must all be satisfied:

(a) $1000v - 1900 \leq 0 \rightarrow i \geq -.474$,

(b) $2000v^2 - 1900 \leq 0 \rightarrow i \geq .026$,

(c) $3000v^3 - 1900 > 0 \rightarrow i < .164$,

(d) $4000v^4 - 1900 > 0 \rightarrow i < .205$.

Interest rates I, II and III satisfy all conditions, but interest rate IV violates the condition required by (c).