

4. *Solution:* We use the formula:

$$p(0, T_n) = \frac{1 - R\delta \sum_{i=1}^{n-1} p(0, T_i)}{a + R\delta}.$$

In this problem, $\delta = 1$, $T_i = i$ (years), $i = 1, 2, 3$. First, we find $p(0, 1)$:

$$p(0, 1) = \frac{1}{1 + .1} = .9090.$$

Then, we can proceed with the bootstrap:

$$p(0, 2) = \frac{1 - (.11)(.9090)}{1 + .11} = .81081,$$
$$p(0, 3) = \frac{1 - (.12)(.9090 + .81081)}{1 + .12} = .708582.$$

Finally, we find the rates:

$$L(0, 2) = -\frac{p(0, 2) - 1}{2p(0, 2)} = .1166,$$
$$L(0, 3) = -\frac{p(0, 3) - 1}{3p(0, 3)} = .137089.$$

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