

**Question #294****Answer: A**

Let  $I_F$  equal 1 if the index drops below its current level in the next year and equals 0 otherwise.

$$E[X_N | I_F = 1] = N(1000)vq_x = 48.54N$$

$$E[X_N | I_F = 0] = 0$$

$$E[X_N] = 0.1(48.54N) + 0 = 4.854N$$

$$\text{Var}[X_N | I_F = 1] = (1000v)^2 Nq_x(1 - q_x) = 44,773.31N$$

$$\text{Var}[X_N | I_F = 0] = 0$$

$$E[\text{Var}(X_N | I_F)] = 0.1(44,773.31N) + 0 = 4,477.33N$$

$$\text{Var}[E(X_N | I_F)] = 0.1(48.54N)^2 + 0 - (4.854N)^2 = 212.05N^2$$

$$\text{Var}[X_N] = 4,477.33N + 212.05N^2$$

$$\frac{\sqrt{\text{Var}(X_{10})}}{10} = 25.69$$

$$\lim_{N \rightarrow \infty} \frac{\sqrt{\text{Var}(X_N)}}{N} = \lim_{N \rightarrow \infty} \frac{\sqrt{4,477.33N + 212.05N^2}}{N} = \sqrt{212.05} = 14.56$$

$$25.69 - 14.56 = 11.13.$$