Exercise 6.16

For a whole life insurance of 150000 to \((x)\), the net future loss random variable is

\[
L_0^n = 150000v^{K+1} - P \bar{a}_K^{K+1}
\]

\[
= \left(150000 + \frac{P}{d}\right)v^{K+1} - \frac{P}{d},
\]

where, based on the equivalence principle,

\[
P = 150000 \frac{A_x}{\bar{a}_x}.
\]

The variance of this future loss can be expressed as

\[
\text{Var}[L_0^n] = \left(150000 + \frac{P}{d}\right)^2 \text{Var}[v^{K+1}]
\]

\[
= \left(150000 + \frac{P}{d}\right)^2 \left[2A_x - (A_x)^2\right]
\]

\[
= (150000)^2 \left(1 + \frac{A_x}{\bar{a}_x}\right)^2 \left[2A_x - (A_x)^2\right]
\]

since \(A_x + \bar{d}a_x = 1\)

\[
= (150000)^2 \left(\frac{1}{1 - A_x}\right)^2 \left[2A_x - (A_x)^2\right]
\]

The standard deviation of this future loss is therefore

\[
\text{SD}[L_0^n] = (150000) \left(\frac{1}{1 - 0.0653}\right) \sqrt{[0.0143 - (0.0653)^2]} = 16076.72.
\]