

Problem 1

Friday, October 25, 2024 10:56 AM

Given a generalized Wiener process with a drift rate of 0.5 per quarter
 and $\sigma^2 = 4.0$ per quarter, and a time horizon of 4 quarters

$$\begin{aligned} \text{Mean} &= \text{initial cash} + (\text{Drift} \cdot \text{Quarters}) \\ &= x + (x \cdot t) = x + (0.5 \cdot 4) = 2.0m \end{aligned}$$

$$\text{Var} = \sigma^2 \cdot t = 4 \cdot 4 = 16.0$$

Since the generalized Wiener process is normally distributed,

$$\text{Cash end of year} \sim N(x + 2.0, 16.0)$$

$$P(\text{cash} < 0) < 0.05 = P\left(Z < \frac{0 - (x + 2)}{4}\right) = N\left(\frac{-x - 2.0}{4}\right) = 0.05$$

$$\text{with } z \text{ score} \Rightarrow \frac{x + 2}{4} = 1.6449$$

$$\Rightarrow x = 1.6449 \cdot 4 - 2 = \$4.58 \text{ mil}$$