

B.21 The performance threshold level $\xi_{5\%}$ is defined by the fact that the probability of the event $X \leq \xi_{5\%}$ equals 5%:

$$P(X \leq \xi_{5\%}) = 0.05.$$

The event $X \leq \xi_{5\%}$ can be written equivalently as follows

$$\begin{aligned}(X \leq \xi_{5\%}) &\Leftrightarrow (1000Y - 10000 \leq \xi_{5\%}) \\ &\Leftrightarrow (1000Y \leq \xi_{5\%} + 10000) \Leftrightarrow (Y \leq \frac{\xi_{5\%}}{1000} + 10),\end{aligned}$$

whereby we have isolated the χ^2 variable on one side of the inequality. Because the events above are equivalent, they must have the same probability:

$$P(Y \leq \frac{\xi_{5\%}}{1000} + 10) = 0.05.$$

Thus

$$\begin{aligned}\frac{\xi_{5\%}}{1000} + 10 &= \chi_{0.05}, \\ \xi_{5\%} &= 1000(\chi_{0.05} - 10),\end{aligned}\tag{1}$$

where $\chi_{0.05}$ is the 5% quantile of $\chi^2(10)$ distribution. From the statistical tables (see, for example, Mood et al. 1974) we find

$$\chi_{0.05} = 3.94,$$

and substituting this value into (1) we obtain

$$\xi_{5\%} = -6060.$$

Thus the one month loss will exceed £6060 only in 5% of cases (roughly once in 20 months).