be used to approximate the distribution function of S_t, and can be used to estimate probabilities, including tail probabilities.

Being finite-sample estimates, these probabilities should have a measure of uncertainty attached. This is obviously an issue for regulation, where the requirement is often to demonstrate that

$$\Pr(S_1 \geq s_0) \leq \kappa_0$$

for some s_0 which reflects the insurer's available capital, and some κ_0 specified by the regulator. For Solvency II, $\kappa_0 = 0.005$ for one-year total losses. A Monte Carlo point estimate of $p_0 := \Pr(S_1 \geq s_0)$ which was less than κ_0 would be much more reassuring if the whole of the 95% confidence interval for p_0 were less than κ_0, than if the 95% confidence interval contained κ_0.

A similar problem is faced in ecotoxicology, where one recommendation would be equivalent in this context to requiring that the upper bound of a 95% confidence interval for p_0 is no greater than κ_0; see Hickey and Hart (2013). If we adopt this approach, though, it is incorrect simply to monitor the upper bound and stop sampling when it drops below κ_0, because the confidence interval in this case ought to account for the stochastic stopping rule, rather than being based on a fixed sample size. But it is possible to do a design calculation to suggest an appropriate value for n, the sample size, that will ensure that the upper bound will be larger than κ_0 with specified probability, *a priori*, as we now discuss.

Let $u_{1-\alpha}(x; n)$ be the upper limit of a level $(1 - \alpha)$ confidence interval for p_0, where x is the number of sample members that are at least s_0, and n