[3] consider sequential confidence intervals for the mean (alternatively for the median) in parametric distributions, symmetric about their center point. The symmetry condition is not suitable for general purpose Monte Carlo applications.

[1] develop a sequential confidence interval for the mean. They begin with a sample $X_1, \ldots, X_m$ for $m \geq 2$ and then continue sampling until

$$N = \min\{n \geq m \mid n \geq \Phi^{-1}(1-\alpha/2)^2(s_n^2 + 1/n)/\varepsilon^2\},$$

where $s_n^2 = (n-1)^{-1} \sum_{i=1}^n (X_i - \bar{X})^2$. The confidence interval that they return is of the form $\bar{X} \pm \varepsilon$ where $\bar{X} = (1/n) \sum_{i=1}^n X_i$. They show that the coverage level approaches $1-\alpha$ in the limit as $\varepsilon \to 0$. The coverage error is $O(\epsilon^p)$ for some $0 < p < 1/2$. A fixed sample size of $N^* = \lceil \Phi^{-1}(1-\alpha/2)^2\sigma^2/\varepsilon^2 \rceil$ would ordinarily be required to get the desired coverage if we knew σ. The Chow and Robbins estimate satisfies $N/N^* \to 1$ in expectation and almost surely as $\varepsilon \to 0$.

[2] give a procedure similar to Chow and Robbins' one that reduces the coverage is at least $1 - \alpha + O(\varepsilon^2)$, at the expense of requiring $\mathbb{E}(|X|^6) < \infty$ and for which $N/N^* \to k > 1$.

Our approach by contrast is non-asymptotic. We consider a fixed level $\varepsilon > 0$ and find an interval of that width with the desired coverage, so long as the kurtosis is below a bound.

References

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