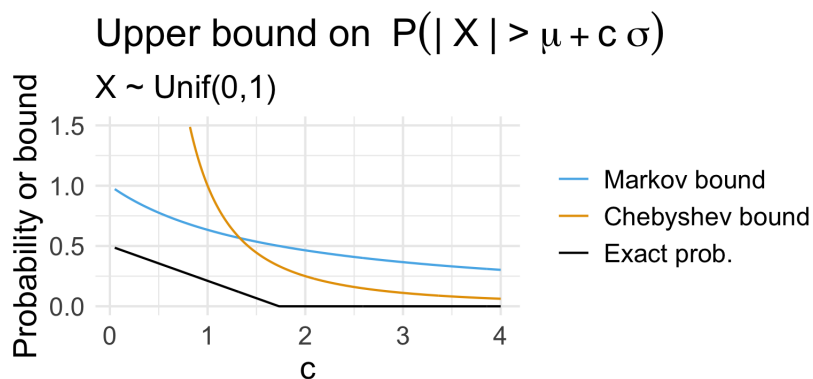
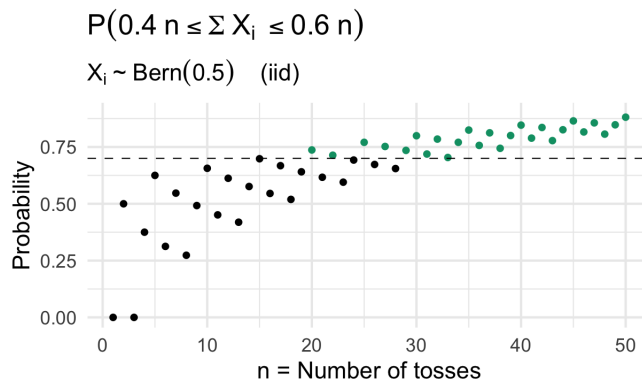


Suppose $X \sim \text{Unif}(0, 1)$. We are interested in the probability that X is more than $c > 0$ standard deviations above its mean. Useful information:

$$\mathbb{E}[X] = \frac{1}{2} \quad \text{Var}(X) = \frac{1}{12} \quad F_X(x) = x \text{ for } x \in (0, 1) \text{ (0 if } x \leq 0, 1 \text{ if } x \geq 1)$$

1. Write the probability of interest as a probability statement in the context of this problem. Then use the CDF to find a formula for this probability.
2. Using Markov, what is an upper bound on the probability of interest?
3. Using Chebyshev, what is an upper bound on the probability of interest?





Inequalities

1. Suppose $X \sim \text{Exp}(1)$. Use each of the Markov and Chebyshev to give upper bounds on the probability that X is more than 3 standard deviations above its mean. Then compute the actual probability of this event. How do each of your bounds compare to the true value?