# Exercise: Chebyshev versus Markov

(2/2 points)

Let $X$ be a random variable with zero mean and finite variance. The Markov inequality applied to $|X|$ yields

$$\mathbf{P}\big(|X| \geq a\big) \leq \frac{\mathbf{E}\big[|X|\big]}{a},$$

whereas the Chebyshev inequality yields

$$\mathbf{P}\big(|X| \geq a\big) \leq \frac{\mathbf{E}[X^2]}{a^2}.$$

a) Is it true that the Chebyshev inequality is stronger (i.e., the upper bound is smaller) than the Markov inequality, when $a$ is very large?

Yes ▾ ✔ **Answer:** Yes

b) Is it true that the Chebyshev inequality is always stronger (i.e., the upper bound is smaller) than the Markov inequality?

No ▾ ✔ **Answer:** No

Answer:
a) Yes, because for very large $a$, the term $1/a^2$ will be much smaller than $1/a$.

b) No. For example, suppose that $a = 1$. It is certainly possible to have $\mathbf{E}[X^2] > \mathbf{E}\big[|X|\big]$, in which case the Markov inequality provides a stronger bound.

*You have used 1 of 1 submissions*