6. Exercise: Chebyshev versus Markov

Exercise: Chebyshev versus Markov

1/2 points (graded)

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?

Yes ▼ ✖ **Answer:** No

Solution:

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.

提交 You have used 1 of 1 attempt

ℹ Answers are displayed within the problem