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Exercise: Chebyshev versus Markov

(2/2 points)

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

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

whereas the Chebyshev inequality yields

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

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 $\mathbf{E}[\mathbf{X}^2] > \mathbf{E}[|\mathbf{X}|]$, in which case the Markov inequality provides a stronger bound.

▶ Exam 2

▼ Unit 8: Limit theorems and classical statistics

Unit overview

**Lec. 18:
Inequalities,
convergence, and
the Weak Law of
Large Numbers**Exercises 18 due Apr
27, 2016 at 23:59 UTC**Lec. 19: The
Central Limit
Theorem (CLT)**Exercises 19 due Apr
27, 2016 at 23:59 UTC**Lec. 20: An
introduction to
classical statistics**Exercises 20 due Apr
27, 2016 at 23:59 UTC

Solved problems

Additional
theoretical
material**Problem Set 8**Problem Set 8 due Apr
27, 2016 at 23:59 UTC

Unit summary

You have used 1 of 1 submissions

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