3. Method of moments estimators

For each of the following distributions, give the method of moments estimator in terms of the sample averages $\overline{X}_n$ and $\overline{X_n^2}$, assuming we have access to n i.i.d. observations $X_1, \ldots, X_n$. In other words, express the parameters as functions of $\mathbb{E}[X_1]$ and $\mathbb{E}[X_1^2]$ and then apply these functions to $\overline{X}_n$ and $\overline{X_n^2}$.

(a)

1/1 point (graded)

$$X_i \sim \text{Ber}(p), \quad p \in (0,1)$$

(If applicable, write **barX_n** for $\overline{X}_n$.)

Method of moments estimator $\hat{p} =$ barX_n ✔

Submit You have used 1 of 3 attempts

(b)

1/1 point (graded)

$$X_i \sim \text{Poiss}(\lambda), \quad \lambda > 0,$$

which means that each X_1 has the pmf

$$\mathbf{P}_\lambda(X = k) = e^{-\lambda}\frac{\lambda^k}{k!}, \quad k \in \mathbb{N}.$$

Method of moments estimator $\hat{\lambda} =$ barX_n ✔

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(c)

1/1 point (graded)

$$X_i \sim \text{Exp}(\lambda), \quad \lambda > 0,$$

which means that each X_1 has density

$$f_\lambda(x) = \lambda e^{-\lambda x}, \quad x > 0.$$

Method of moments estimator $\hat{\lambda} =$ 1/barX_n ✔

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(d)

2.0/2 points (graded)

$$X_i \sim \mathcal{N}(\mu, \sigma^2), \quad \mu \in \mathbb{R}, \sigma^2 > 0,$$

which means that each X_1 has density

$$f_{\mu,\sigma^2}(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right).$$

(If applicable, enter **barX_n** for $\overline{X}_n$ and **bar(X_n^2)** for $\overline{X_n^2}$.)

Method of moments estimator $\hat{\mu} =$ barX_n ✔

Method of moments estimator $\widehat{\sigma^2} =$ bar(X_n^2)-barX_n^2 ✔

STANDARD NOTATION

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(e)

2/2 points (graded)

X_i follows a shifted exponential distribution with parameters $a \in \mathbb{R}$ and $\lambda > 0$. That means each X_i has density

$$f_{a,\lambda}(x) = \lambda e^{-\lambda(x-a)} \mathbf{1}\{x \geq a\}, \quad x \in \mathbb{R}.$$

(If applicable, enter **barX_n** for $\overline{X}_n$ and **bar(X_n^2)** for $\overline{X_n^2}$.)

Method of moments estimator $\hat{a} =$ barX_n - sqrt(bar(X_n^2)- ✔

Method of moments estimator $\widehat{\lambda} =$ 1/sqrt(bar(X_n^2)-barX_n^2) ✔

STANDARD NOTATION

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✔ Correct (2/2 points)

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Please, check second of e)
I put wrong answer, but it shows green. :) Should I put right answer? 8

Typo: b) X_1 has density ...
It is discrete. 2

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