Exercises: Estimator Precision and Confidence Interval (2)

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Assume we have an estimate of an two-dimensional x vector as $\hat{x} = \begin{bmatrix} 100 \\ 100 \end{bmatrix}$. In the following question, there are five covariance matrices ($Q_{\hat{x}\hat{x}}$) corresponding to five different estimators of x. In addition to the covariance matrices, six different two-dimensional confidence intervals (or confidence regions/ellipse) are provided. In these plots, the corresponding 68.3%, 95.4%, and 99.7% confidence regions are denoted as blue, red, and green ellipses, respectively. Drag each covariance matrix and drop it to its associating confidence-region plot.

Covariance matrix and Confidence region

1/1 point (ungraded)

Keyboard Help

PROBLEM

Drag the correct correct covariance matrix to the corresponding confidence region (ellipse) plots

Graded Assignment due Feb 8, 2017 17:30 IST

Q&A Forum

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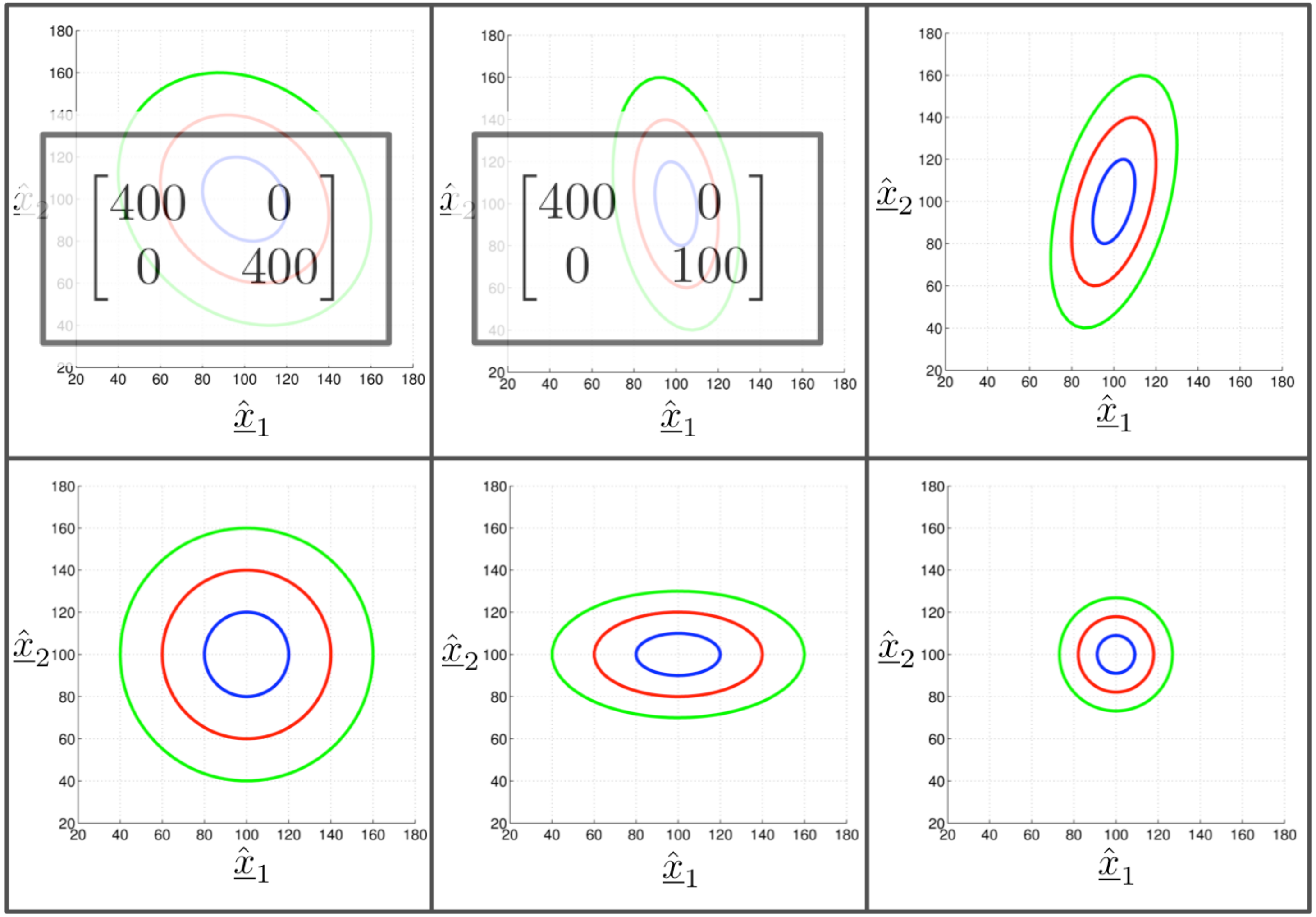
- 6. Does the estimate make sense?
- Pre-knowledge Mathematics
- MATLAB Learning Content

$$\begin{bmatrix} 400 & -80 \\ -80 & 400 \end{bmatrix}$$

$$\begin{bmatrix} 100 & -50 \\ -50 & 400 \end{bmatrix}$$

$$\begin{bmatrix} 100 & 90 \\ 90 & 400 \end{bmatrix}$$



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ℹ Good work! You have completed this drag and drop problem.

Error propagation for average (2)

1/1 point (ungraded)

An unknown parameter x is estimated by taking the average of m observations: $\underline{\hat{x}} = \frac{1}{m}\sum_i^m \underline{y}_i$ where $\underline{y}_i$ are independent and $\underline{y}_i \sim \mathrm{N}(0, \sigma_y^2)$.

What will be the 95 percent confidence interval of $\hat{x}$?

- ( ) $\hat{x} \pm \frac{1.96}{m}\sigma_y^2$
- (x) $\hat{x} \pm \frac{1.96}{\sqrt{m}}\sigma_y$ ✔
- ( ) $\hat{x} \pm \frac{1.96}{m}\sigma_y$
- ( ) $\hat{x} \pm \frac{2}{\sqrt{m}}\sigma_y$

Feedback

$$\underline{\hat{x}} = [\tfrac{1}{m}\ \ \tfrac{1}{m}\ \ \cdots\ \ \tfrac{1}{m}]\begin{bmatrix}\underline{y}_1\\ \underline{y}_2\\ \vdots\\ \underline{y}_m\end{bmatrix}, \quad \sigma_{\hat{x}}^2 = [\tfrac{1}{m}\ \ \tfrac{1}{m}\ \ \cdots\ \ \tfrac{1}{m}](\sigma_y^2 I_m)\begin{bmatrix}\frac{1}{m}\\ \frac{1}{m}\\ \vdots\\ \frac{1}{m}\end{bmatrix} = \frac{\sigma_y^2}{m}, \quad \sigma_{\hat{x}} = \frac{\sigma_y}{\sqrt{m}}$$

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✔ Correct (1/1 point)