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Assessment

Exercises: Estimator Precision and Confidence Interval (1)

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Confidence intervals and the normality assumption (1)

1/1 point (ungraded)

Assume a linear model $\mathbf{E}\{\underline{y}\} = Ax$, with $\mathbf{D}\{\underline{y}\} = Q_{yy}$. The BLU estimator is given as

$$\underline{\hat{x}} = (A^T Q_{yy}^{-1} A)^{-1} A^T Q_{yy}^{-1} \underline{y},$$

and the estimator variance is given as $\sigma_{\hat{x}}^2 = (A^T Q_{yy}^{-1} A)^{-1}$. An estimate $\hat{x}$ is also given. Then is the following statement true or false?

For all kinds of observables $\underline{y}$, the 95 percent confidence interval is $[\hat{x} - 1.96\sigma_{\hat{x}}, \hat{x} + 1.96\sigma_{\hat{x}}]$

- True
- False ✔

Answer

Correct: If the observabales are not normally distributed, the statamenet is not correct.

Graded Assignment due Feb 8, 2017 17:30 IST

Q&A Forum

Feedback

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

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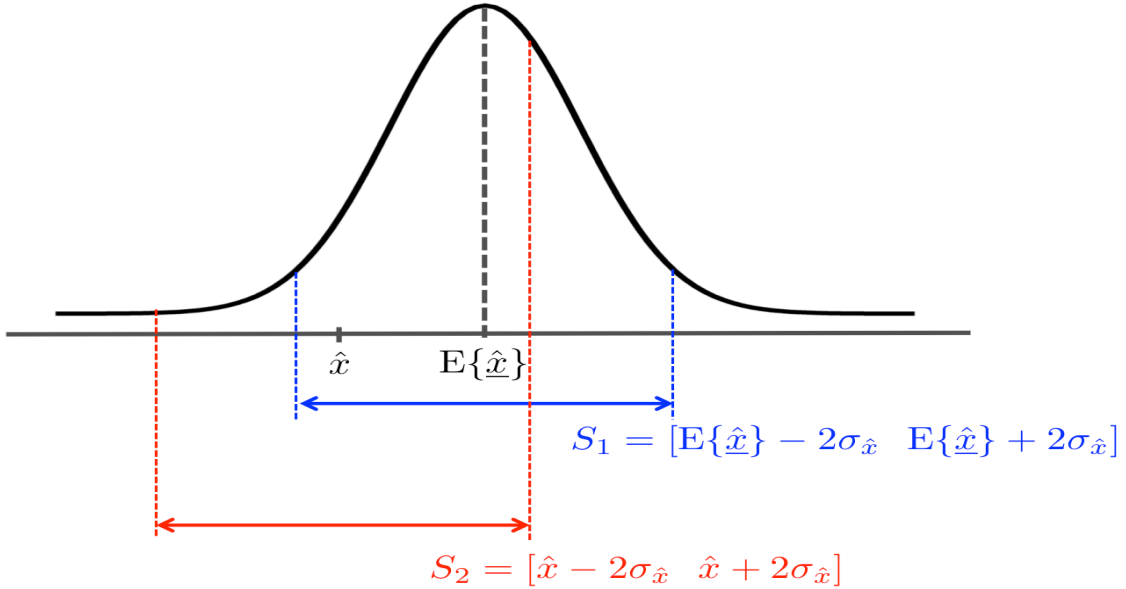
✔ Correct (1/1 point)

Confidence interval definition?

1/1 point (ungraded)

Assume a linear model $\mathbf{E}\{\underline{y}\} = \boldsymbol{A}\boldsymbol{x}$, with $\mathbf{D}\{\underline{y}\} = \boldsymbol{Q}_{\boldsymbol{yy}}$. The observables are normally distributed and $\underline{\hat{\boldsymbol{x}}}$ is the BLU estimator of $\boldsymbol{x}$ with variance $\boldsymbol{\sigma}^2_{\hat{\boldsymbol{x}}}$. An estimate $\hat{\boldsymbol{x}}$ has been also given. As observables are normally distributed, the BLU estimator is also normally distributed. The following figure shows the PDF of the estimator and its corresponding expectation.



Two intervals have been shown in the figure. Which interval is the 95.4% confidence interval, which is commonly used in practice?

- S_1 interval (indicated by blue).
- S_2 interval (indicated by red). ✔

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✔ Correct (1/1 point)

Computing confidence intervals

4/4 points (ungraded)

For each case, select the requested confidence interval.

A) $\hat{x} = 10$ and $\sigma_{\hat{x}} = 1$. What is the 99% confidence interval?

- $[7 \;\; 13]$
- $[6.71 \;\; 13.29]$
- $[7.5 \;\; 12.5]$
- $[7.42 \;\; 12.58]$ ✔

B) $\hat{x} = 2$ and $\sigma_{\hat{x}}^2 = 25$. What is the 68.3% confidence interval?

- $[-3 \;\; 7.5]$
- $[-7.8 \;\; 11.8]$

- ◉ $[-3 \;\; 7]$ ✔
- ○ $[-23 \;\; 27]$

C) $\hat{x} = 500$ and $\sigma_{\hat{x}} = 8$. What is the 99.7% confidence interval?

- ○ $[-24 \;\; 24]$
- ◉ $[476 \;\; 524]$ ✔
- ○ $[479.36 \;\; 520.64]$
- ○ $[473.68 \;\; 526.32]$

D) $\hat{x} = \begin{bmatrix} \hat{x}_1 \\ \hat{x}_2 \\ \hat{x}_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 20 \\ 30 \end{bmatrix}$ and $\mathbf{D}\{\hat{x}\} = \begin{bmatrix} 25 & 4 & 2 \\ 4 & 30 & 3 \\ 2 & 3 & 100 \end{bmatrix}$. What is the 95.4% confidence interval of $\hat{x}_2$?

- ○ $[9.26 \;\; 30.73]$

- ◉ $[9.04 \;\; 30.95]$ ✔
- ○ $[5.86 \;\; 34.13]$
- ○ $[3.56 \;\; 36.43]$

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✔ Correct (4/4 points)