Bookmarks

- 0. Getting Started
- 1. Introduction to Observation Theory
- 2. Mathematical model
- 3. Least Squares Estimation (LSE)
- 4. Best Linear Unbiased Estimation (BLUE)
- **5. How precise is the estimate?**

Warming up

5.1. Error Propagation

5.2. Confidence Intervals

Assessment

Module 5 Assessment - Part 2 (incl. Matlab)

In the following Matlab assignment, you should fit a quadratic polynomial to a synthetic (accelerating) sea level rise dataset. The dataset is given in the 'W6_syntheticdata2.txt' file, and it contains yearly sea level measurements over 20 years (in total 20 observations). The time of observations are given in years as $[1,\ 2,\ 3,\ \ldots,\ 20]$. The observations are assumed to be normally distributed and have a precision of σ **=5 cm**. The sea level at time zero is unknown and should also be estimated together with the annual rate x_1 and the acceleration component x_2. So in total, we have three unknown parameters as indicated in the following functional model for an observation y_i

$$\mathrm{E}\{\underline{y}_{t_i}\} = x_0 + x_1 t_i + x_2 t_i^2.$$

In this assignment, you should

1. Import the data, create the design matrix A, and the covariance matrix Qy
2. Compute the BLUE of parameters, as well as the BLUE of adjusted observations and residuals (xhat, yhat, and ehat)
3. Compute the corresponding covariance matrices of xhat, yhat, and ehat
4. For vectors xhat, yhat, and ehat, compute the lower and upper bounds of the **97%** confidence interval

Graded Assignment due Feb 8, 2017 17:30 IST

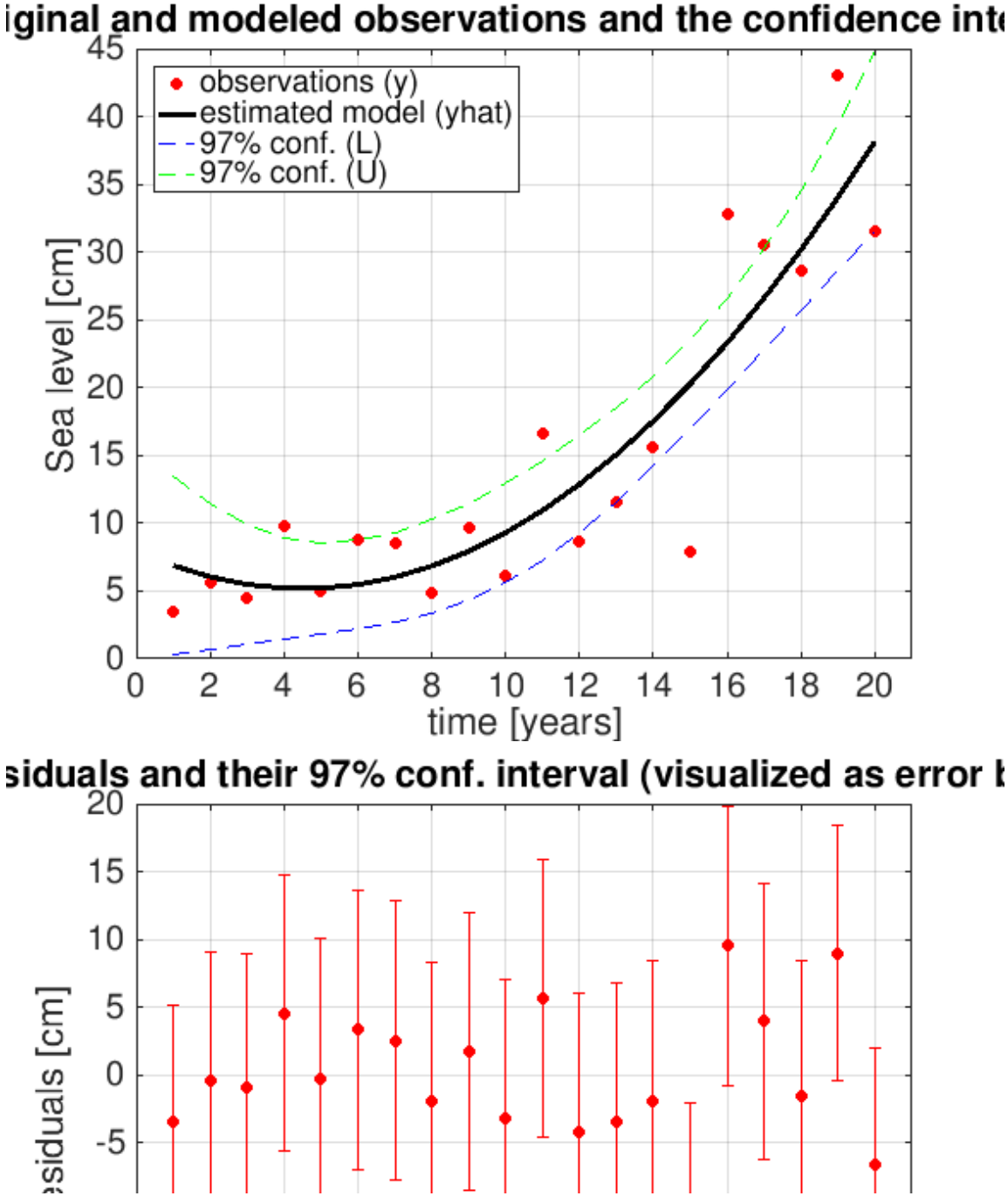
Q&A Forum

Feedback

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

5. Plot the original and adjusted observations, together with the **97%** confidence interval of yhat and ehat

ACCELERATING SEA LEVEL RISE (MATLAB EXERCISE) (EXTERNAL RESOURCE)


iginal and modeled observations and the confidence inte
observations (y)
estimated model (yhat)
97% conf. (L)
97% conf. (U)
Sea level [cm]
time [years]
siduals and their 97% conf. interval (visualized as error b
esiduals [cm]

BLUE and the confidence intervals (sea level rise problem)

6/6 points (graded)

Insert the requested values...

The lower bound of the 97% confidence interval of the initial value x_0 in cm (upto 2 decimal places, note the correct sign of the value!)

-0.10

✔ **Answer:** -0.097

-0.10

The lower bound of the 97% confidence interval of the linear rate x_1 in cm/year (upto 2 decimal places, note the correct sign of the value!)

-3.02

✔ **Answer:** -3.016

-3.02

The upper bound of the 97% confidence interval of the acceleration parameter x_2 in cm/year^2 (upto 2 decimal places)

0.22

✔ **Answer:** 0.219

$$0.22$$

The upper bound of the 97% confidence interval of 10th adjusted observation $\hat{y}_{10}$ in cm (upto 2 decimal places)

12.93

✔ **Answer:** 12.929

$$12.93$$

The lower bound of the 97% confidence interval of 12th residual $\hat{e}_{12}$ in cm (upto 2 decimal places)

-14.40

✔ **Answer:** -14.403

$$-14.40$$

Correlation coefficient between BLUE estimators of the annual rate x_1 and the acceleration parameterx_2 (upto 2 decimal places, note that the Correlation coefficient should be between -1 and 1. use the correct sign!)

-0.97

✔ **Answer:** -0.97

$$-0.97$$

Submit You have used 2 of 3 attempts

✔ Correct (6/6 points)