Module 6 Assessment - Part 2 (incl. Matlab)

This final assignment is the same as the example that you have already solved in module 3 (section 3.1, linear trend + annual signal). Here you should apply the overall model test and validate the results.

Observations: 10 years of data (in mm) from the the tide gauge station in IJmuiden (stored in the file 'Ijmuiden.txt')

Functional model and unknowns: As a functional model you should use the linear trend + annual signal model (where the initial phase is unknown, we called this the shifted sine). That is the following observation equation for a sea level observation at t_i :

$$\mathrm{E}\{y_i\} = l_0 + r\Delta t_i + a_s \sin(2\pi\Delta t_i) + a_c \cos(2\pi\Delta t_i)$$

So in total we have four unknown parameters: l_0 in mm, r in mm/yr , a_s in mm, and a_c in mm.

Stochastic model: assume observables are normally distributed and independent, all with the standard deviation of 5 cm.

Assignment:

1. Create a design matrix A, and estimate xhat and calculate yhat and ehat.

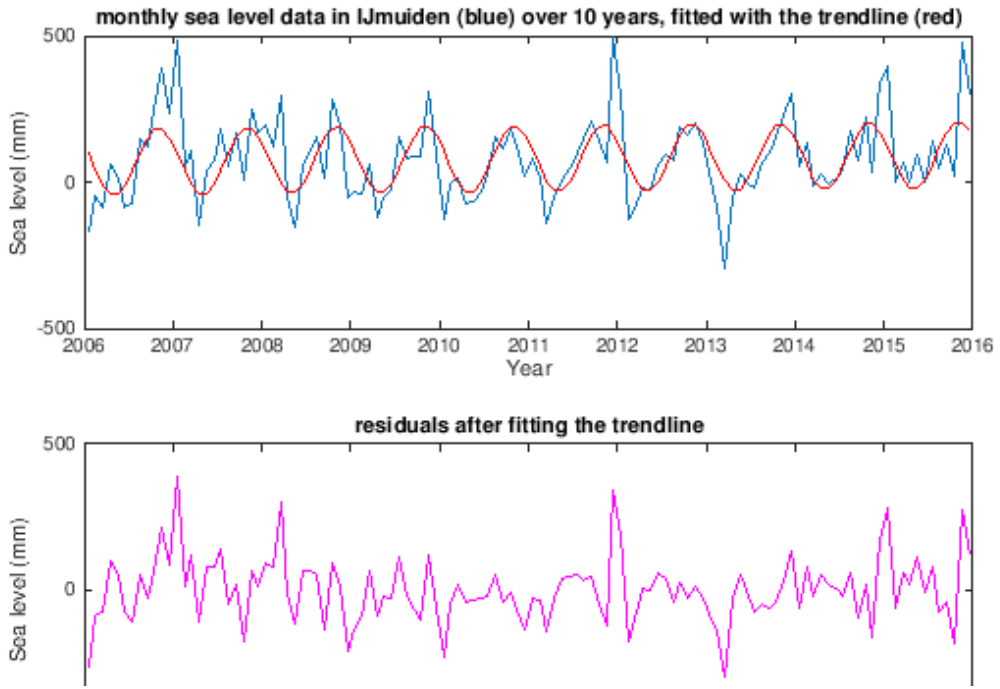
2. Compute the test statistics and the critical value for the overall model test (use the level of significance of 0.05)

3. Decide the test is accepted or not? If not why?

SEA LEVEL RISE AND OVERALL MODEL TEST (MATLAB EXERCISE) (EXTERNAL RESOURCE)

- ✔ covariance matrix Qyy?
- ✔ xhat?
- ✔ ehat?
- ✔ test statistic Tq?
- ✔ critical value K?

Output



Test statistic?

2/2 points (graded)

What is the estimated test statistic Tq? (upto 2 decimal places)

603.81 ✔ **Answer:** 603.81

603.81

Submit You have used 1 of 1 attempt

✔ Correct (2/2 points)

Critical value K?

2/2 points (graded)

What is the critical value $K_{0.05}$? (upto 2 decimal places)

142.14 ✔ **Answer:** 142.14

142.14

Submit You have used 1 of 1 attempt

✔ Correct (2/2 points)

OMT accepted or not?

1.0/1.0 point (graded)

Was the overall validity if the assumed mathematical model accepted or rejected?

- Accepted
- Rejected ✔

Submit You have used 1 of 1 attempt

OMT interpretation

2.0/2.0 points (graded)

In case of rejection, what whould be the reason? (more than one option may be correct)

- The test was accepted, aso the question is not relevant.

- [x] The simple model of linear trend and a periodic/annual signal can not explain sufficiently the dynamics of the sea level. ✔
- [x] The stochastic model of $\sigma = 5$ cm may be too optimistic. ✔
- [x] There could be some outliers in the data. ✔
- [ ] The number of observations is not enough.

✔

Submit You have used 1 of 2 attempts