

# Homework Assignment no. 2

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## RATIONAL PARAMETRIC METHODS

This second homework is based on **Exercise C3.18** (old book) / **C3.20** (new book) (and **Exercise C2.21/C2.23** in parts).

For your convenience, code for the different spectral estimators can be downloaded at <http://www.prenhall.com/stoica>. Make sure that you use these functions correctly, (use “help”. If still in doubt how to use the functions, try by inspecting the code directly.) Here follow some explanations and clarifications for the corresponding parts of **Exercise C3.18/C3.20**:

By “Apply your favorite AR and ARMA estimator(s)” we mean that you should carefully consider how to choose the required user parameters, especially the model orders  $m$  and  $n$ . Motivate your choices.

For the “sunspot” data, plot the spectra for AR and ARMA separately using `subplot(2,2,·)` to keep the number of pages down and to make the comparison easier. For the “lynx” data, plot the resulting spectra using both methods separately, and in addition, plot the corresponding spectra obtained by first performing the logarithmic transform of **Exercise C2.21/C2.23** on the data. How do these two approaches differ? Use dB scale in all figures in order to simplify the interpretation of the results. Mark on each plot where the most significant signal peaks are located.

Discuss the questions and remarks raised in the textbook. Single sentence answers are not sufficient. For the discussion on nonparametric vs. parametric methods, you need to solve **Exercise C2.21/C2.23** partly as well. This should be straightforward. Discuss the differences between nonparametric and parametric methods. How could a combination of these two approaches be used to estimate the spectral and periodic structure of the data?