

LECTURE 6

EXERCISE 1. ANALYTICAL CALCUALTIONS

Do exercise 3.11 in the book.

Tip. Start estimating $R_{zz}(\tau)$

EXERCISE 2. THE AUTOCORRELATION OF WHITE NOISE

The power spectrum of a white noise process is 1 for all frequencies

$$S_{xx}(f) = 1$$

Find the autocorrelation $R_{xx}(\tau)$

Confirm the results in Matlab. Use `randn` to generate the white noise and `xcorr` to do the autocorrelation

EXERCISE 3. MATLAB IMPLMENTATION OF THE AVERAGE PERIODOGRAM

Write two matlab functions one which estimates the PSD by the normal of periodogram and one which estimates the PSD by the averaging of periodograms. See slides 40,48-50.

Test the functions at realizations of the random process generated with `genSTProcess.m`.

<http://person.hst.aau.dk/sschmidt/SP/genSTProcess.m>

Generate an ensemble which includes 5 realizations of the random process. Estimate the PSD from each of the realizations using both the normal and average Periodogram. Quantify the variance between the different PSD estimates and exam the influence of the segment size in the average Periodogram.

Plot a curve which describes the relationship between the variance between the spectrums from the different realizations and the segment length.