

ME384Q.3 / ORI 390R.3: Time-Series Analysis

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Homework 3

Assigned Wednesday, February 20th, 2019;

Due Thursday, February 28th, 2019, in class

Problem 1 (repeated from the last homework)

For a random process X_t governed by a time-series model of the form

$$X_t - X_{t-1} + X_{t-2} = a_t - 3a_{t-1}$$

please express analytically the auto-covariance function. Comment on what you see.

Sales Data Problem: For the retail sale data posted on the class website (originating form before the economic calamity of 2007/2008), please do the following

- a) Even if you did this problem correctly in the first homework, please remove the linear trend from the data (if you did not do this correctly in the first homework, this time you should). In other words, please take the raw retail sales data and **model it as a linear function of time**, i.e.

$$y_t = \beta_0 + \beta_1 t + \varepsilon_t$$

where y_t are raw retail sales data from the file, t is the time index (index of the month – you can start it from zero and go up to the end of the time-series), parameters β are to be estimated through least squares approach and ε_t are residuals of this linear fit.

- b) Use the modeling strategy based on F-testing, which we just learnt in class to find the adequate ARMA(n,m) model for the residuals ε_t left after you de-trended the data in part (a).
- c) Use the Akaike Information Criterion (AIC) to find the adequate ARMA(n,m) model for the residuals ε_t left after you de-trended the data in part (a). Note, you are looking for the model with the minimum AIC value.
- d) Please comment on differences you see in parts b) and c). What could be the sources of those differences?

Please also do the following problems from the textbook:

Problems 4.8

Problem 4.10