

**OPRE 6398.003 Prescriptive Analytics  
Homework 8**

**Due 03/29/17  
(11:30 a.m.)**

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Note: 1. Your homework submission must be typewritten.

2. Show only the solutions and do not copy the problems in the submission.

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1. Read Reading 10.

2. Air pollution control specialists in the DFW area monitor the amount of ozone, carbon dioxide, and nitrogen dioxide in the air on a monthly basis. The data collected for the past four years are summarized below.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	168	182	203	232	238	317	358	292	238	242	228	197
2014	182	203	217	243	267	328	402	333	262	268	257	218
2015	193	212	228	282	288	392	418	332	288	297	278	252
2016	217	223	242	303	312	438	412	333	317	318	307	273

(1) Use a computer software program (e.g., Excel) to plot the time series and comment on the data pattern exhibited, if any.

(2) Which forecasting method would be most appropriate for predicting the level of air pollution in the future and why?

(3) Based your findings in (2) above, forecast the monthly air pollution levels in 2017. Be sure to carry four decimal places for irrational numbers.

3. As part of a social responsibility policy, Small Time Enterprise (STE) in Sherman, TX, runs a retraining program for workers displaced from positions in the firm's various businesses. The erratic nature of the displaced employees' training requirements has made it difficult for STE's educational administrator to predict the staff needed for the program. Nevertheless, she has collected the data given in the accompanying table:

Month no.	1	2	3	4	5	6
No. of hours	4,100	3,900	4,200	4,000	3,700	4,300

Three forecasting methods are being considered: naïve, 2-month simple moving average, and simple exponential smoothing with  $\alpha = 0.2$  and an initial forecast of 3,500 hours for Month 4. Be sure to carry four decimal places for irrational numbers.

(1) Use each of the three approaches to develop forecasts for appropriate past periods and then compute the forecast errors. Summarize all the results in a table similar to the one in the solutions to Example 11.7.

(2) Which of the three methods is most reliable based on the MAD criterion and why?

(3) Based on your findings in (2) above, provide a forecast of the time requirement in Month 7.

(4) Compute the MSE for each of the three forecasting models discussed above.

(5) Which of the three methods is most reliable based on the MSE criterion and why?

4. During the past four hours, the Port of New Orleans in Louisiana unloaded large quantities of grain from ships and relevant data are summarized in the table below:

Hour	Quantity unloaded (tons)
1	1,700
2	1,670
3	1,690
4	1,720

- (1) Use the naïve approach to develop a forecast of the tonnage of grain unloaded in each hour up to the 4<sup>th</sup> hour.
- (2) Repeat (1) above by using the 2-hour weight moving average method with weights of 0.4 and 0.6.
- (3) Which of the two forecasting techniques is more accurate based on MAD? Be sure to carry four decimal places for irrational numbers.
- (4) Which of the two forecasting techniques is more accurate based on MSE? Be sure to carry four decimal places for irrational numbers.
- (5) Are your conclusions in (3) and (4) consistent? If not, what can be done to determine which of the two techniques should be used to provide future forecasts of quantities to be unloaded at the port?