Example for Chapter 9 Stat286

1. Consider the example in Chapter 3. (Page 80). We want to understand the effect of the price on sales. In chapter 3, we developed a model to estimate the *percentage* effect on sales of a 1% increase in price. We considered the weekly sales (in thousands of units) of Brand 1 in a major US market chain over a year as a function of the price each week. We considered the following model: log(Sales) = β0 + β1log(Price) + e

Consider two other predictors:

Week = week of the year (time);

Promotion=1 if price reduction advertised in the newspaper and in an in-store display.

The data set name is **confood2.txt**.

1. Make a scatterplot of log(Sales) against log(price), using different symbols for whether there is a promotion or not. What can you conclude for the effect of promotion?
2. Make a scatterplot for log(Sales) against Week (time), what can you say about the change in log(Sales) over time?
3. Make another scatterplot of log(Sales) against the log(Sales) of previous week. (called SalesLag1 in the data) What can you conclude about the correlation between Sales on week t and sales on week t-1?
4. Graph the autocorrelation of log(Sales). What can you conclude?
5. Now, fit the following model,

log(Sales) = β0 + β1log(Price) +β2 Week + β3 Promotion +e (1)

Look at the plot of residual against Week (time t). What can you conclude?

1. Now, find the GLS (generalized least-square) estimate for model (1). Also, graph the autocorrelation function of the generalized least-square residuals. What can you conclude?
2. Obtain the estimates by using the transformation. Comparing the estimates, the standard deviation and the t-values to numbers you got from (f). What can you conclude?
3. Graph the autocorrelation function of the residuals using the transformation method. Are they auto-correlated?
4. Look at the residual plots and the other diagnostic plots for the transformation method model, what can you say?
5. Perform a Durbin-Watson test to the model e, using the ordinary least-square estimates. Do you have first-order auto-correlation?
6. Now, perform the Durbin-Watson test to the residuals obtained from using the transformed method, are they auto-correlated?
7. According to Tryfos (1998), the savings and loan associations in the Bay area od San Francisco had an almost monopolistic position in the market for residential real estate loans during the 1990s/ Chartered banks had a small portion of the market, and saving and loans association located outside the region were prevented from making loans in the Bay Area. Interest centers on developing a regressive model to predict interest rates (Y) from x1, the amount of loans (in millions of dollars) and x2, the vacancy index, since both predictors measure different aspect of demand for housing. Data is saved in the file: **BayArea.txt**.
   1. First make scatter plot to see a linear model is appropriate.
   2. As a starting point, just fit the data with the linear model. Look at the residuals and the ACF plot, what can you conclude?
   3. Now, perform the Durbin-Watson test to see whether the errors are positively auto-correlated.
   4. Use the GLS to estimate the auto-correlation coefficient.
   5. Find the GLS estimates for the coefficients.
   6. Using the transformed method to get the fitted model with AR(1) error.
   7. Look at the diagnostic plots for the transformed model, do you think the modle is valid?
8. The Blaisdell Company wished to predict its sales by using industry sales as a predictor variable. A portion of the seasonally adjusted quarterly data on company sales (First column) and industry sales (second column) for the period 1998-2002 is saved in data named **Ch12TA02.txt.** (Kutner, Chapter 12). As a market research analyst, your job to find a model that uses the industry sales to predict the company’s sales.