



Mihaylo College of Business and Economics
Department of Information Systems & Decision Sciences

PROJECT #3

ISDS 526: Forecasting for Analytical Decision Making

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Case Study: Mobile-Home Shipments



Issue

Kim Brite and Larry Short have developed a series of exclusive mobile-home parks in which each unit occupies a site at least 100×150 feet. Each site is well landscaped to provide privacy and a pleasant living environment. Kim and Larry are considering opening more such facilities, but to help manage their cash flow they need better forecasts of mobile-home shipments/sales, MHS, since MHS appears to influence their vacancy rates and the rate at which they can fill newly opened parks. They have 16 years of data on mobile-home shipments, beginning with 1988Q1 and ending with 2003Q4.

The Assignment

Assuming that Kim Brite and Larry Short have hired *your group* as a forecasting consultant, your

role is to prepare a forecasting report. Due to its simplicity and appeal to small business managers, you have decided to use *multiplicative classical time series decomposition* as your forecasting method. To help you address some of the pertinent forecasting issues, you organized your report as follows, in that order.

1. **The Forecasting Problem:** Within the context of the case, define the forecasting problem.
2. **Examining Data Patterns:** using visual inspection of the data as well as autocorrelation analysis, examine the time series patterns of the data. Your examination should at least address the following issues: trend, and seasonality. Also conduct differencing analysis (simple and/or seasonal as required) to help you better understand the correlogram. Make sure to append your time series plot and correlogram, and both figures should be appropriately referenced and discussed.
3. **Analysis of Seasonality:** write a brief memo in which you report the nature and extent of the seasonality in the data. Include seasonal indices in your discussion. Also provide a time series plot of the actual MHS data along with the deseasonalized data.
4. **Trend Analysis:** develop a long-term linear trend for the data, based on the centered moving averages. On the basis of this trend, advise if the future look promising for Brite and Short?
5. **Analysis of Cycle:** one of the things Ms. Brite and Mr. Short are concerned about is the degree to which MHS is subject to cyclical fluctuations. Calculate cycle factors and plot them in a time series graph.
6. **Analysis of Fitted Forecasts:** demonstrate for Ms. Brite and Mr. Short how well your time series decomposition model follows the historical pattern in the data by plotting the actual values of MHS and those fits by the model in a single time series plot.

7. **Forecasts:** prepare forecasts for the 4 quarters of 2004. To prepare your forecasts, you need forecasts for **the cycle factor**. Try *two* possible approaches: **Box-Jenkins** and **Regression** approaches.

- a) Use simply Forecast Pro's automatic Box-Jenkins models to directly forecast the cycle forecast for 2004. To this in forecast pro: first create a CF time series in Forecast pro format. Make sure to enter the correct starting quarter and other important items. Then, go to settings and put 6. Finally, select the forecasting model to be **Box-Jenkins – make sure to force a constant**.

Reminder: *Do not holdout anything. We are only interested in forecasting the future here.*

- b) Use Excel (Data Analysis) to estimate a quadratic relationship between Cyclical Factor (**CF**) from the decomposition and Number of unemployed people who claimed unemployment insurance (**x**). In equation form:

$$CF = b_0 + b_1x + b_2x^2 + e$$

Data on **CF** and **x** is available for **1988Q1 – 2003Q4**. To implement this in Excel, you need to have three columns of data for CF, x and x². Then, simply run regression of CF on the other two variables. Excel will provide you with estimates of b0 and b1. Therefore, the estimated relationship between **CF** and **x** is given by:

$$CF = \hat{b}_0 + \hat{b}_1x + \hat{b}_2x^2$$

Note that the hats indicate that these are estimates from Excel.

Finally, how do you obtain forecasts of CF for 2004? Just plug into the above estimated model the values of **x** for 2004 which are given below.

Period	Actual
2004 Q1	354769
2004 Q2	343846
2004 Q3	340538
2004 Q4	329692

Please include some discussion of the following issues regarding (b) above. Why do you think I am asking you to use a quadratic instead of a linear model between CF and x ? Is the quadratic model better than a linear model? To do the latter in Excel, simply ignore x^2 .

8. **Evaluation of Forecast Accuracy:** use the following actual values of MHS for 2004 to evaluate the accuracy of your forecasts. Use only MAPE to measure accuracy.

Period	Actual
2004 Q1	35.4
2004 Q2	47.3
2004 Q3	47.2
2004 Q4	40.9

Does the Initial Claim of Unemployment Insurance benefit help improve forecast accuracy? If it does, try to give business/economic justifications.

9. **Conclusion**