

**CALIFORNIA STATE UNIVERSITY
DEPARTMENT OF STATISTICS**

**Statistics 4866/6871: Seminar - Introduction to Times Series Analysis
Summer 2005**

Take-home Midterm

Instructions: This is a take-home exam. You are expected to work on the exam alone. If you have questions about the exam you may ask the instructor.

1. (Stat 4866/6871) (Average Air Temperature Recife Brazil, 1953-1962.) The following problem is to describe and understand the variation in the temperature data.
 - (a) Plot the data $\{x_t\}$ and describe its main features.
 - (b) Perform a Classical Decomposition of the data, $X_t = S_t + T_t + I_t$.
 - (c) Are there any unusual years in the data?
2. (Stat 4866/6871) (Yield on short-term British government securities.) Find a suitable time-series model and compute forecasts up to 12 months ahead.
 - (a) Plot the data and describe its main features. Is there a seasonal pattern?
 - (b) Suggest and apply an appropriate transformation that transforms the data to a stationary time series.
 - (c) Fit an ARIMA model to this set of data and justify your choice by examining the appropriate ACF, PACF, and residual plots.
 - (d) Give the estimated model and the value of the AIC.
 - (e) Calculate the formula for the one-step ahead forecast x_{n+1}^n .
 - (f) Forecast the time series 12 months ahead. Comment.
3. (Stat 4866/6871) (Monthly totals of international airline passengers, Jan. 1949 to Dec. 1960.) Fit an ARIMA model to the data and produce forecasts up to one year ahead.
 - (a) Plot the data and describe its main features.
 - (b) Suggest and apply a transformation that stabilizes the variance of the data.
 - (c) Suggest and apply a transformation that transforms the data to a stationary time series.
 - (d) Identify an appropriate ARIMA model for this set of data and specify any goodness-of-fit methods used in your selection process.
4. (Stat 6871) Problem 2.19, page 205.
5. (Stat 6871) Determine the best exponential smoothing forecasts for the three time series in the construction data.
6. (Stat 6871) Run the decomposition program for the electricity data and comment on the components of the time series.