

STAT 804

Assignment 3

1. The Splus command

```
attach('/home/math4/lockhart/Teaching/courses/804/datasetsS5')
```

will make a dataset *influenza* available. If you type

```
ls(pos=2)
```

you will see the data set for this question and the next two. Alternatively, you can copy an ASCII file containing the data set via the UNIX command

```
cp ~lockhart/Teaching/Courses/804/datasetsS5/influenza.dat .
```

The file can be used to create an SPlus object using

```
source("influenza.dat")
```

The data consist of monthly counts of influenza cases over a 9 and a half year period. Fit an ARIMA model to the data.

2. Fit an ARIMA model for the Johnson and Johnson earnings per share data which is in the dataset *earnings*. There are 20 years of quarterly data. You can get an ASCII file containing the data set using

```
cp ~lockhart/Teaching/Courses/804/datasetsS5/earnings.dat .
```

3. Fit an ARIMA model for the data set called *fake*. You can download an ASCII file containing the data set

```
cp ~lockhart/Teaching/Courses/804/datasetsS5/fake.dat .
```

4. For the data set *raindiff* in the ASCII file

```
cp ~lockhart/Teaching/Courses/804/datasetsS5/raindiff.dat .
```

fit the model

$$X_t - \mu = \phi(X_{t-1} - \mu) + \epsilon_t$$

where the ϵ_T are iid $N(0, \sigma^2)$ in each of the following ways

- (a) By full maximum likelihood. (Maximize the joint density of the X 's over the parameters μ , ϕ and σ ; don't condition on anything.)

- (b) By estimating μ by the sample mean and then doing full maximum likelihood for the model

$$Y_t = \phi Y_{t-1} + \epsilon_t$$

where $Y_t = X_t - \bar{X}$.

- (c) By estimating μ by the sample mean and then doing conditional maximum likelihood for the previous model.

Remarks: I do not want you to use *ar* or other built-in S time-series functions to do these but you may want to use them to get starting values for estimates. It is probably easier to do the methods in reverse order, using the results as starting points for iterative solutions.