

### Computer Tutorial 3: Principal Components and the Static Factor Model

The file `Excess>Returns_xls` contains monthly data from January 1990 through December 2003 on the excess stock return of 13 companies relative to the market return. The names of the 13 companies are given in Table 9.1 of Tsay's textbook. The market return is taken to be the return on the S&P 500 index which is also included in the data set in the column labelled `SP5`.

Question 1: For each of the 13 companies individually, do a market model analysis and produce estimates of the stock return  $\beta$  and  $R^2$  for each of the 13 companies.

Question 2: Carry out a principal components analysis on the excess stock returns of the 13 companies using Stata's PCA command (in Stata's Multivariate Analysis).

- a) Stata first produces a table with column headings "Eigenvalues, Difference, Proportion, Cumulative". Explain what each of these is and what information each provides the researcher.
- b) Stata then produces a table with title "Principal components (eigenvectors)". Explain how this table can be interpreted.
- c) Make a scree plot and use it to decide how many of the components should be retained.

Question 3: Carry out a static factor analysis on the excess stock returns of the 13 companies using the default option on Stata's factor command (in Stata's Multivariate Analysis).

- a) Stata first produces a table with column headings "Eigenvalues, Difference, Proportion, Cumulative". Explain what each of these is and what information each provides the researcher.
- b) Stata then produces a table with title "Factor loadings (pattern matrix) and unique variances". Explain how this table can be interpreted.
- c) Make a scree plot and use it to decide how many of the factors should be retained.
- d) Now carry out a static factor analysis using maximum likelihood. Produce information criteria (type "estat factors" into the command window after running maximum likelihood) and use them to select the number of factors.
- e) Compare the results of Question 2 and those obtained using the two estimation methods of Question 3.