

## Computer Tutorial 4: The Dynamic Factor Model

The file `macro_data_DFM.xlsx` contains monthly US data on 10 US macroeconomic aggregates taken from the FRED-MD data set. This is the data set used for the empirical illustration of dynamic factor methods in the lecture. These variables are in levels form and I transformed them to stationarity following the recommendations on the FRED-MD website. You could use this data set for this exercise, but it would take too long to run in the computer tutorial and, hence, please use the following four variables for this exercise: 1) real person income (RPI), 2) industrial production (INDPRO), 3) employment (PAYEMS) and 4) stock prices (SP500). If you are interested, you can find complete descriptions of these variables on the FRED-MD website (<https://research.stlouisfed.org/econ/mccracken/fred-databases/>).

- a) Log first difference all of the variables so as to create new variables which measure the percentage change in each original variables. Use these new variables in the remaining parts of this question. You may also use Stata's default settings for the `dfactor` command (described in the lecture) for this tutorial. However, if you are ambitious you may wish to experiment with other non-default specifications if you wish to see the functionalities of Stata and its ability to estimate more flexible models.
- b) Estimate the dynamic factor model with  $p = q = m = 1$  (i.e. one lag in every equation and one factor) and plot filtered and smoothed estimates of the factor.
- c) Repeat part b), but with  $p = 0$  (i.e. where the factor equation has no lags) and plot filtered and smoothed estimates of the factor.
- d) Repeat part b) but with  $p = q = 0$  (i.e. this is the static factor model) and plot filtered and smoothed estimates of the factor.
- e) Compare your results for parts b), c) and d).
- f) Estimate dynamic factor models with  $m = 1$ , but with various choices for  $p$  and  $q$ . Use information criteria to choose the optimal number lags in the equations.