2nd set GAUSS assignments Financial Econometrics

In this practical exercise we try to evaluate the GMM objective function via a two-dimensional grid search for the Consumption Based Model (for details on the CBM, see Cochrane(2001) ch.1 and ch.2).

The basic pricing equation for the return of any asset i is:

$$E_t[m_{t+1}R^i_{t+1}] = 1$$

with m_{t+1} being the stochastic discount factor. In the Consumption Based Model the stochastic discount factor is the marginal rate of substitution:

$$m_{t+1} = \beta \frac{u'(c_{t+1})}{u'(c_t)}$$

Using the power utility function this results in

$$m_{t+1} = \beta \left(\frac{c_{t+1}}{c_t} \right)^{-\gamma}$$

This result can be translated directly into moment conditions:

$$E_t[m_{t+1}R^i_{t+1} - 1] = E_t \left[\beta \left(\frac{c_{t+1}}{c_t} \right)^{-\gamma} R^i_{t+1} - 1 \right] = 0$$

1. Create an objective function to estimate the parameter β and γ

First, load the consumption growth data and the return data into a GAUSS matrix. Consumption growth data from 2nd quarter 1947 to 4th quarter 1993 are provided in the file `consgr_1947Q2_1993Q4.fmt`. Return data for ten portfolios (1st size decile to 10th size decile) from 2nd quarter 1947 to 4th quarter 1993 are provided in the file `ret_dec10_1947Q2_1993Q4.fmt`. You can load those files with the `load` command (look it up in the GAUSS Help).

GAUSS procedure:

Write a procedure which returns the objective function

$$Q(\beta, \gamma) \equiv g' W g$$

where W is the identity matrix and

$$g = \begin{bmatrix} \frac{1}{T} \sum_{t=1}^{T} \left[\beta \left(\frac{c_{t+1}}{c_t} \right)^{-\gamma} R^1_{t+1} - 1 \right] \\ \vdots \\ \frac{1}{T} \sum_{t=1}^{T} \left[\beta \left(\frac{c_{t+1}}{c_t} \right)^{-\gamma} R^{10}_{t+1} - 1 \right] \end{bmatrix}$$

2. Evaluating the objective function

GAUSS procedure:

Evaluate the objective function for different values of β and γ in a grid search. Save the values of β and γ together with the corresponding value of the objective function and plot them either in a three-dimensional `XYZ` plot or a three-dimensional surface plot or both. Preparing the data for a surface plot is slightly less intuitive, therefore start with the `XYZ` plot. (Hint: Use this procedure as the main procedure which will be called later. Therefore, nest the previous procedure inside.)