8th set GAUSS assignments Financial Econometrics

1. Time Series regression: CAPM

Use excess returns $R_t^{ei} = R_t^i - R_t^f$ to conduct a (pooled) time series regression for all assets on the market portfolio as a single factor:

$$R^{ei} = \alpha_i + \beta_i f_t + \epsilon_t^i$$

R_t^i are the returns on the ten Cochrane portfolios ($i = 1, 2, .., 10$) used in the previous assignments, for R_t^f use the T-bill rate given in `t-bill.fmt`. The factor f_t is the excess market return contained in `exmret.fmt`. Use the GMM toolbox to estimate the parameters. The moment conditions are:

$$g_T(b) = \left[\begin{array}{c} E_T(R^{ei} - \alpha_i - \beta_i f_t) \\ E_T[(R^{ei} - \alpha_i - \beta_i f_t) f_t] \end{array} \right] = \left[\begin{array}{c} E_T(\varepsilon_{it}) \\ E_T(\varepsilon_{it} f_t) \end{array} \right]$$

Further, compute the GRS test statistic for $H_0 : \alpha_1 = \alpha_2 = \ldots = \alpha_{10} = 0$ which is asymptotically the following:

$$T \left[1 + \left(\frac{E_T(f)}{\hat{\sigma}(f)} \right)^2 \right]^{-1} \hat{\alpha}' \hat{\Sigma}^{-1} \hat{\alpha} \sim \chi_N^2$$

Hint: $\hat{\Sigma}$ can be computed from the regression residuals ($\hat{\varepsilon}_i$). Further compute the corresponding p-value (the Gauss command `cdfchic` might be of help).

2. Time Series and Cross-sectional regression: log CBM

We can write a linear factor model as: $E[R^{ei}] = \beta_i \lambda$. The βs can be derived from a time series regression, which are then used to estimate λ in a cross-sectional regression of average returns on the betas: $E[R^{ei}] = \beta_i \lambda + \alpha_i$ (see Cochrane p.235ff for details). Or, we can simply estimate the βs and λ at the same time using GMM. Considering a single factor model, the moments are:

$$g_T(b) = \left[\begin{array}{c} E_T(R^e - a + \beta f_t) \\ E_T[(R^e - a + \beta f_t) f_t] \\ E_T[R^e - \beta \lambda] \end{array} \right]$$

The last N (number of return series, in our case portfolios) moment conditions are the pricing errors (α's).
Estimate the parameters by GMM using the log(!) consumption growth as a factor. (`consgr_1947Q2_1993Q4.fmt` contains consumption growth data). Further use the ten

Cochrane portfolios from above.

The test statistic for $H_0 : \alpha_1 = \alpha_2 = \ldots = \alpha_{10} = 0$ can be calculated as follows:

$$g_T^*(\hat{b_\alpha})' Avar(g_T^*)^+ g_T^*(\hat{b_\alpha}) \sim \chi^2_{N-1}$$

$g_T^*(\hat{b_\alpha})$ are the last N moment conditions evaluated at the estimated parameter values. $Avar(g_T^*)^+$ is the pseudoinvers of the covariance matrix of the last N moment conditions. The moment conditions evaluated at the optimized parameter estimates and their covariance matrix are returned by the GMM toolbox: `_gmmout_m` and `_gmmvarm`. Note that these globals refer to all moment conditions, so you have to read out those parts associated with the last N moment conditions. The command `pinv` returns the pseudoinvers of a matrix. Calculate the test statistic and the corresponding p-value.

This assignment can be handed in for grading until 20th January 2009.
If you want to hand in this assignment for grading, include a pdf file (beside your program code) that shortly describes the procedures. Describe the idea behind the time-series and cross-sectional regressions with respect to linear factor models. Why is it helpful to estimate all parameters at the same time with GMM as we did in Task 2 (see Cochrane p. 241f)?
Send your program code and the pdf file to franziska-julia.peter@uni-tuebingen.de