6th set of assignments Financial Econometrics

1. Conduct a (pooled) time series regression: Regress the excess returns for each for all assets on the three Fama/French factors (a brief description of those factors is provided in the fifth set of assignments): $R^{ei} = \alpha_i + \beta_{i1} f_{t1} + \beta_{i2} f_{t2} + \beta_{i3} f_{t3} + \epsilon_t^i$.

   where

$$\begin{aligned} f_{t1} &= (R_t^m - R_t^f) \\ f_{t2} &= (R_t^H - R_t^L) \\ f_{t3} &= (R_t^S - R_t^B) \end{aligned}$$

   Test the hypothesis that all parameters α_i are jointly equal to zero ($H_0 : \alpha_1 = \alpha_2 = \ldots = \alpha_N = 0$). The asymptotic test statistic is the following:

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

   where

$$\begin{aligned} f_t &= (f_{t1}, f_{t2}, f_{t3})' \\ \hat{\alpha} &= (\alpha_1, \alpha_2, \cdots, \alpha_N)' \\ \hat{\Omega} &= \frac{1}{T} \sum_{t=1}^{T} [f_t - E_T(f_t)][f_t - E_T(f_t)]' \\ \hat{\Sigma} &= \frac{1}{T} \sum_{t=1}^{T} \hat{\varepsilon}_t \hat{\varepsilon}_t' \\ \hat{\varepsilon}_t &= (\varepsilon_t^1, \cdots, \varepsilon_t^N) \quad \text{with} \quad \varepsilon_t^i = R^{ei} - \hat{\alpha}_i - \beta' f_t \end{aligned}$$

   - Use the data set `cochranes_deciles_from_lecture.wf1` provided on the home page of the course
   - For R^m, optionally, the series `avvwret` or `avewret` can be chosen
   - R^f is the series `avustret`
   - The returns R are collected in the series `decile1` to `decile10`. To compute excess returns, subtract `avustret` from the return of each decile.
   - f_1 can be constructed from R^m (optionally, the series `avvwret` or `avewret` can be chosen) and R^f (`avustret`) as above for the CAPM
   - f_2 is provided directly in `HML_r` (**IMPORTANT**: substract 1 from the series to obtain excess returns instead of gross returns)
   - f_3 is provided directly in `SMB_r` (**IMPORTANT**: substract 1 from the series to obtain excess returns instead of gross returns)

   - Hints for the application in EViews:
     - Create a new Pool object and name it (e.g. assets).
     - Next, you are asked to provide 'cross section identifiers'. Write 1-10 in that window.

- Now, you can estimate the regressions by specifying as the dependent variable decile? where ? is used as a wildcard for the cross section identifiers. As explanatory variables, specify the three factors and a c as intercept (deactivate the default intercept). Note, that all β_{ij} are asset specific.
- Save the residuals via `Proc - Make Residuals` in a group and name the group (e.g. residuals)
- Create a group with the three factors
- Calculate the mean vector and the VC-matrix of the factors and the VC-matrix of the residuals and store them in vectors, respectively matrices (use the functions `@mean()` and `@cov()`)
- Store the number of observations (use `scalar t=assets.@regobs`) and the α_i in a scalar, respectively vector (if the α_i are the first ten elements in the coefficient vector then write `vector alpha=@subextract(assets.@coefs,1,1,10,1)`)
- Now, compute the test statistic given above (though the result is a scalar, assign the test as a matrix since matrix operations have to be conducted (`@transpose` and `@inverse`)). Further, specify the 1 in the test statistic as a 1×1-matrix.
- Calculate the p-value of the test as in the fifth set of assignments