

Time Series Regression and GRS-statistic in EViews

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Objective:

1. Estimation of CAPM in expected return-beta form.

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

for our 10 test assets (size portfolios).

2. Test if all α_i are jointly equal to zero ($H_0 : \alpha_1 = \alpha_2 = \dots = \alpha_N = 0$).

Therefore, constructing the asymptotic GRS-Statistic

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

Implementation in EViews:

1. First, create a new Pool object and name it (e.g. capmts)
2. Provide 'cross section identifiers'. Write 1-10 in that window
3. 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.

4. Save the residuals via Proc - Make Residuals in a group and name the group (e.g. residuals)

5. Calculate the mean vector and the standard deviation of the factor and the VC-matrix of the residuals and store them in scalars, respectively matrices (use the functions @mean(), @stdev() and @cov())

```
scalar e_f=@mean((avewret-avustret))
```

```
scalar sigma_f=@stdev((avewret-avustret))
```

```
matrix sigm1=@cov(residuals)
```

6. Store the number of observations and the α_i in a scalar, respectively vector.

```
scalar t=capmts.@regobs
```

```
vector alpha=@subextract(capmts.@coefs,1,1,10,1) (if the  $\alpha_i$   
are the first ten elements in the coefficient vector)
```

7. 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)).

```
matrix grs1=@transpose(alpha)*@inverse(sigm1)*alpha  
scalar buff=grs1(1,1)  
scalar grs=T*buff/(1+(e_f/sigma_f)^2)
```

8. Calculate the p-value of the test.

```
scalar pval=1-@cchisq(grs,10)
```