Advanced Econometrics II
Large Programming Assignment Part 1

Deadline: 08.02.2015, 23:59

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Please submit your (typed) solution in a `pdf` file. **Please motivate all your answers.** The code has to be put, **together with** the main `pdf` solution file, in an archive file (e.g. `zip` or `rar`). Each code file shall contain your name.

Question 1

The data for this exercise can be found in file `Data1.csv`, which contains the monthly prices on Microsoft stock ($MSFT_t$) and the S&P 500 index ($GSPC_t$) over the period January 1990 through December 2000.

1° Construct the variables r_t and s_t to denote the returns of $MSFT_t$ and $GSPC_t$, respectively[1]. Run the following regression by OLS

$$r_t = \beta_0 + \beta_1 s_t + \beta_2 s_{t-1} + \varepsilon_t. \tag{1}$$

Report the estimation results.

2° Report three different sets of standard errors:

i) the usual OLS ones, assuming homoskedasticity;

ii) ones based on the simplest HCCME;

iii) ones based on the HCCME correcting for the downward bias in the squared OLS residuals[2].

For each set of standard errors, report the resulting t statistics. Comment on your results. In particular asses whether the OLS standard error seem reliable.

3° Still assume no serial autocorrelation, but allow for heteroskedasticity of ε_t. Recall that in such a situation, when $\Omega \neq \sigma^2 \mathbb{I}$, the OLS estimator for $\beta = [\beta_0, \beta_1, \beta_2]^T$ is not the most efficient one. Hence, use the feasible GMM estimator with r_{t-1}^2, s_t^2, s_{t-1}^2 and s_{t-2}^2 taken as "additional instruments"[3]. Comment whether you could indeed observe an improvement in efficiency (compared to the OLS case).

4° Check whether the assumption of lack of serial autocorrelation of ε_t in (1) is realistic. For this purpose, test the null hypothesis that the ε_t are serially uncorrelated versus the alternative that they follow an AR(1) process.

[1] You can use differences of the log prices.

[2] Cf. Section 5.5 DM.

[3] More precisely: taken as instruments in addition to the original explanatory variables. This will lead to 7 moment conditions that can be used in the GMM context (and different from TSLS).

5° Report the Newey-West HAC standard errors of the OLS parameter estimates in (1), with the lag truncation parameter set to $p = 1, \ldots, 8$.

6° Again, use r_{t-1}^2, s_t^2, s_{t-1}^2 and s_{t-2}^2 as "additional instruments" to obtain feasible efficient GMM estimates of the parameters in (1) by minimizing the corresponding criterion function using the HAC estimators[4].

7° Finally, obtain the HAC estimators for $p = 5$ using the iterative procedure[5]. Recall that in this method the HAC estimator is updated based on the new parameter estimates and then this updated HAC estimator is employed to update the parameters estimates themselves. Comment on your results.

[4]Recall the formula for the feasible GMM criterion function (9.42), based on e.g. NW HAC estimator.

[5]Cf. Section 9.3 DM.