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MSc in FM/MTF/QF

Foundations of Econometrics
GROUP COURSEWORK
Academic Year 2024/2025, Fall 2024

The file **Coursework_SMM270_SMM271_2024-2025.xlsx** contains daily prices of eight stocks in US$ over the period 22/00/2000 – 22/00/2024.

1. **Data transformation.** Consider the following four stocks. Aggregate the original series in quarterly averages, transform the quarterly averages in natural logarithms and name the resulting series as follows: **lp1q**=ln(JPMORGAN), **lp2q**=ln(APPLE), **lp3q**=ln(PEPSICO), and **lp4q**=ln(MSDONALDS).

2. **Stationary vs nonstationary time series.**
   a. Are the time series **lp1q**, **lp2q**, **lp3q,** and **lp4q** trend or difference stationary? Briefly explain.
   b. Provide unit roots tests to evaluate the order of integration of each of the four series: report the results of the test procedures and briefly comment also on the basis of Holden and Perman (1994).

3. **Model specifications and misspecification tests.** Suppose there is a linear relationship between **lp1q** (dependent variable) and **lp4q** (independent variable). From an autoregressive distributed lags model of order 1, **ADL(1),** you may derive nine alternative "nested" models:
   a. Estimate all of them, report and comment the relevant misspecification tests.
   b. Choose the model you consider the "best" and explain why.

4. **Cointegration *vs* spurious regression.**
   a. Do **lp3q** and **lp4q** cointegrate? Or rather, do spuriously correlate? Test and briefly comment the empirical findings.
   b. Elaborate (one-page essay) on cointegration vs spurious regressions also on the basis of your reading of Ferson et al. (2003a,b) and Hendry (2004, Section II pp. 189-194), and Hendry (2004, Section IV pp. 198-204), respectively.
   c. Estimate and comment (also on the basis of Hendry (2004, Section III pp. 194-198) the results of the implementation of the 2-step Engle&Granger procedure and of the unrestricted equilibrium-correction models

5. **Granger causality.** Test whether movements in **lp4q** Granger-causes movements in the other three stock prices.

Report the test and comment the empirical findings, by elaborating (one-page essay) on Granger-causality in econometrics on the basis of Hendry (2004, Section VI pp. 204-205) and Thurman and Fisher (1988) and relevant references cited therein.

6. **(G)ARCH models.** Consider the original series at ==daily frequency==, take their natural logarithms, and name them as follows: **lp1**, **lp2**, **lp3**, **lp4**. Consider the first difference of the series, namely **Dlp1**, **Dlp2**, **Dlp3**, **Dlp4**, and

   a. Test for ARCH effects in each of time series by means of a Lagrange multiplier test.
   b. Identify the best univariate GARCH representation amongst the alternative models you know. Report the results of the tests and briefly comment.

Notes:
- ✓ The deadline for the (group) coursework to be uploaded on Moodle is 4pm on Friday, 29th November 2024.
- ✓ It is advisable to use OxMetrics9 to execute the empirical applications. However, feel free to use any of the following alternative packages: STATA, Python, R and Matlab.
- ✓ The length of the coursework cannot exceed 8 pages.

Giovanni Urga, Tuesday, 01 October 2024