McGill University
Department of Economics
Econ 662D2: Graduate Econometrics I
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Course outline

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Term paper

The term paper consists is analyzing 3 time series which are possibly related to each other. The paper should present the following elements. It should be typed. Up to 2 students can work on the same term paper.

1. Tile-page
2. Table of contents
3. Introduction
   The introduction must provide the purpose of the text, summarize the content of each section as well as the main conclusions.
4. Data
   (a) For each series, the following information should be provided: the name of the series, the period covered, the frequency (e.g., annual, quarterly), the source of the data.
   (b) Tables of data (always provide the date in the first column):
      i. raw data;
      ii. data in first differences;
      iii. data in logarithm (if feasible);
      iv. first differences of the data in logarithm (if feasible).
5. Graphical analysis

(a) Graphs of the data given in the tables (raw and differenced).
Indicate clearly the dates on the abscissa (x-axis), the values of the variables on the y-axis, and measurement units.

(b) From these graphs, describe and compare the behavior of the different series.
Important features to observe:

   i. the presence or the absence of a trend, the type of trend;
   ii. whether the curve is smooth or irregular;
   iii. the presence of cycles and/or seasonal fluctuations;
   iv. the presence of discontinuities:
      A. in the mean or the trend;
      B. the volatility of the series;
      C. outlying observations.

   Decide which series look stationary.
   Summarize your observations in a table.

6. Univariate time series analyses
Take out the equivalent of 2 years of observations at the end of each series.

(a) Preliminary specification
For each series (raw or transformed), present the following results.

   i. Autocorrelation analysis
      A. Table and graph of autocorrelations (at least 12 lags, covering 3 years or more) with the relevant standard errors for testing the order of the moving average.
      B. Table and graph of the partial autocorrelations (at least 12 lags, covering at least 3 years) with the relevant standard errors.
      C. With nonparametric bounds on autocorrelation standard errors, test the hypothesis that the observations are i.i.d.
   ii. Unit root tests
   Test the hypothesis that the series contains a unit root in its autoregressive part.

   For each one of the three series, choose a transformation which seems to stationarize the series and an ARIMA specification.

(b) Estimation
For each of the three models obtained (one for each series), present parameter estimates.

(c) Diagnostic checking
For each model, present diagnostic checks and explain why the model appears to be satisfactory (or not).

(d) Forecasting

   i. For each series, present forecasts (table and graph) covering at least 10 years. Discuss the short-run and long-run behaviors of these forecasts.

ii. For the two years excluded from the sample, compare the forecasts with observed values and test whether the forecast errors are significantly different from zero.

7. Multivariate time series analysis
   Consider at least 3 series on which you have done univariate analyses. Take out at least two years of observations at the end of each series.

   (a) Compute cross-correlations and test the order of a vector autoregressive model (partial autoregressions) for the series considered.
   (b) Test for the presence of cointegrating relations between the series.
   (c) Build a VAR [or VARMA] model for the selected series.
   (d) Analyze causality between the series.
   (e) Forecast the observations excluded from the analysis. Compare the quality of these forecasts with those obtained from univariate models.