

# Economics 761

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This course, which bears the nominal title of “Time Series”, is in fact an advanced econometrics course with something of a time-series orientation, although it is not limited exclusively to time-series issues. In particular, there is a good deal of time devoted to the bootstrap, from both theoretical and applied points of view.

For the material that can be considered as textbook material, I use some chapters from *Econometric Theory and Methods*, my book written jointly with James G. MacKinnon, published in 2004 by Oxford University Press. The relevant chapters are 13 and 14, which deal respectively with stationary and nonstationary series.

Time series topics covered include:

- AR, MA, and ARMA processes, their stationary distributions based on the Yule-Walker equations, and how to simulate them.
- Estimation of ARMA models by maximum likelihood, conditional and unconditional. Artificial regressions are proposed as a convenient tool of estimation.
- Autoregressive conditional heteroskedasticity, ARCH and GARCH, along with more artificial regressions.
- Vector autoregression (VAR) and Granger causality.
- Random walks and unit roots. Spurious regression. Dickey-Fuller tests, and the asymptotic theory thereof, including the theory of Brownian motion.
- Serial correlation and unit root tests. Augmented Dickey-Fuller tests.
- Error-correcting models.
- Cointegration and estimation of cointegrating vectors and spaces.
- Testing for cointegration. (Augmented) Engle-Granger tests, tests based on error-correcting models, Johansen’s tests.

Other topics less closely related to time series include:

- Monte Carlo tests based on pivotal statistics.
- Bootstrap tests with nonpivotal statistics. The bootstrap discrepancy.
- Bootstrap techniques in the context of econometric models. Bootstrap  $P$  values and bootstrap confidence sets.
- Bootstrap theory, and its consequences for simulation.
- The fast double bootstrap.
- The power of bootstrap tests.

You'll have seen the following in all of your course outlines, because the McGill Senate requires that it should appear in all of them. I used to think of it as a pure formality, but a disturbing number of cases of plagiarism have been detected in recent years, not especially at McGill, but in other North American universities. So, please take seriously the admonitions in the following text.

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