

22. **Title: Time Series Analysis**

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One important area of statistics that is not covered in Part A/B/C lecture courses is Time Series. This project would be an opportunity for a student to learn some of the relevant theory and also to do some time series analysis using R.

Many statistical methods relate to data which are independent, or at least uncorrelated. There are many practical situations where data might be correlated, particularly where repeated observations on a given system are made sequentially in time. Data gathered sequentially in time are called a time series: e.g. daily stock market quotations, monthly unemployment figures, daily (or monthly) temperature data, etc. A time series can often be viewed as a Markov process.

Many time series models of interest can be written as state space models, allowing a unified mathematical treatment. The first part of the project would be for a student to read, understand and present his/her own account of these models.

The second part of the project would be to find, with guidance, some time series data of interest and to analyse it using R. For example, in the media we often hear it reported that the price of some commodity is predicted to go up, perhaps the price of grain, or the price of oil, etc. These examples could be investigated, or the student may wish to identify alternative questions of interest and data to investigate.

Prerequisites: None particularly, BS3a Applied Probability might be helpful, use of R is expected.

Type of project: Some theory plus some data analysis.

References: Two appropriate books are

P.J. Brockwell and R.A. Davis (2002) *Introduction to Time Series and Forecasting*. Second Edition. Springer.

R.H. Shumway and D.S. Stoffer (2006) *Time Series Analysis and Its Applications: With R Examples*. Second Edition. Springer.

Many other books on time series would provide similar background.