

Case studies on Financial Mathematics  
Lorentz Centre  
Friday March 9, 2000

The case studies will partly be taken from the set of exercises of the part on Time Series Analysis. In addition to those we have the following.

### Case study

Each group will get a financial data set (e.g. a series of the daily closing index of stock prices). The goal of the study is to investigate this particular data set in various ways.

1. Estimate the annual volatilities and return rates.
2. Price a European call option on this underlying instrument (start prices and expiration dates will be given to each group separately).
3. Investigate the data set for stationarity and explore various ways to make it stationary.
4. Investigate the distributions and the autocorrelation functions of relative and log-returns and the daily volatilities.
5. Fit a linear autoregressive model and investigate its fit and predictive power.
6. Estimate a suitable ARCH model for this return sequence. Deduce from this a suitable range in which the volatility takes its values (either by inspection of some graphs or by a more formal calculation).
7. How sensitive is the option price (calculated before) for changes in the volatility in this range?
8. Suppose you hold a portfolio consisting only of this instrument. Estimate a 10 days horizon 5% VaR by various methods and check the obtained values against empirical evidence
9. Prepare a (short) presentation of your findings.