Statistics 956 Homework No. 3 (Revised 1/25/05)
Due Monday January 31.

Reading

- Review the material in Zivot and Wang on the creation of time series objects and the use of the timeDate() function.
- Familiarize yourself with Wharton Research Data Services by poking around at http://wrds1.wharton.upenn.edu
- Review the note WRDStoFinMet.txt which is posted on our web page.

WRDS Data and Exploration of a Return Series

- Download from WRDS the series of daily returns for an NYSE stock of interest to you. Start can your series with the first trading day of 1990, but we won't use the whole series.
- Follow the plan in WRDStoFinMet.txt to bring a 1000 day section of your series into into S-Plus and to put it into a finmetrics time series structure. The reason for restricting your self to 1000 days is an artificial constraint of the student version of S-plus.
- Now here is a question of serious practical importance: "Is it reasonable to regard the returns as Gaussian?"
  1. What does normalTest() suggest? Explore both the "sw" and "bj" methods.
  2. What does qqnorm() suggest? (Technical Note: You will need to use seriesData() to extract the data series.)
  3. Use qqplot() and to compare the distribution of your stock returns to the distribution of the t-statistic for various degrees of freedom. If you had to model your returns as a t-statistic, what choice would you make for the degree of freedom.
- Now a follow-up question "Is it reasonable to regard the returns as Gaussian *white noise*?" Specifically, does your series exhibit significant autocorrelation? You should use the S-Plus functions acf() and autocorTest() to address these questions. Explore both the default and your own choices of the lag.n parameter.

Philosophical Perspective on the "Black-Scholes" Model

It is worth recalling that the Black-Scholes formula is based on the model assumption that returns can be viewed as Gaussian white noise. It is probable that your empirical investigations suggest that for the series you choose, the returns did not behave like Gaussian white noise. Can we really be so lucky as to draw a valid conclusion (the Black-Scholes formula) from an invalid model (geometric Brownian motion)?