Statistics 956 Homework No. 6
Due Monday February 21.

Reading

- Read ZW pages 209–226. Review your old text on hypothesis testing.

- Read the help files (and links!) on simulate.garch(), archTest(), garch().

Evidence for Heteroscedasticity and Tools for GARCH Modeling

- Get 800 days of return data for one of your favorite stocks. Call this data series D. Next, let R denote the time series of zeros and ones determined by $R = D > \mathrm{median}(D)$ and let S be the time series determined by $S = D^2 > \mathrm{median}(D^2)$.

- Does the series R show evidence of "clumpiness"? How about the series S? We will discuss some measures in class, but you should feel welcome to consider your own measures, or test statistics. What principles might guide your choice?

- Use archTest() on your series D to see if this tool suggests the presence of ARCH effects. Fit an appropriate GARCH model to your data D. How might you judge that the fit has been informative?

- Now, by using simulate.garch(), explore how well garch() works. For example, you might first generate a GARCH(1,1) series of length 1000 and then fit a GARCH(1,1) model 10 times using just the data slices 1-100, 1-200,..., 1-1000. Can you plot your results in an informative way?

How to Present Your Work

After you have made your explorations, you should summarize your discoveries in a one or two page Executive Report. As before, the report should contain all of the facts that you think are important or interesting, but it should omit unnecessary details. Your report can refer to a few figures, tables, or plots, but you should think about what you want to include.

Again, as before, your report should contain some extrapolation of your experience. There is plenty of flexibility built into this assignment, but everyone's time is limited and we can all think of more things to do. Whenever you get the chance, you should generalize about what you have learned and you should record the further work you might do if you had time.

Perspective

The second half of this assignment is mainly to provide you will basic experience with GARCH model fitting, while the first half serves to remind you that one can always "go back to basics." In fact, any phenomenon of genuine importance will manifest itself in many ways, and one should never be too stuck on a particular technology. In particular, there are almost innumerably ways to engage the heteroscedasticity that one finds in return series.