HIDDEN MARKOV CHAIN EXERCISE

In this exercise you will use the data on CPI, 3-month Treasury bill rates, and output that you used in the previous exercise, plus data on commodity prices (PPICRM from the FRED database online — price index for crude materials for futher processing), to estimate a single regression equation, with log CPI explained by three lags each of the interest rate, log output, and log PPICRM. You are to set the equation up to have time varying variances of the residual, using three states. (Assume coefficients remain constant — only the residual variance changes.) Show plots of the smoothed state probabilities and the standardized residuals (standardizing by the time $t - 1$ conditional standard deviation of the time-t residual) to assess whether the model is capturing the non-Gaussianity in the disturbances. Compare the coefficients to what you find without time-varying residual variances.

There are matlab programs on the course web site that evaluate likelihood and make draws from posteriors for a single-equation regression with time varying residual variance as in this exercise. There are also two programs that were used in a previous year's course for a simpler model with only two states; those programs might be useful as templates for you in setting up the solution to this exercise.