MATLAB Computer Session 3: State Space Modelling

Dimitris Korobilis and I have created a website containing Matlab code for Bayesian estimation of VARs and other models popular with empirical macroeconomists
(see *http://personal.strath.ac.uk/gary.koop/bayes_matlab_code_by_koop_and_korobilis.html*). It is associated with our monograph. Koop, G. and Korobilis, D. (2010). *Bayesian Multivariate Time Series Methods for Empirical Macroeconomics* which is available on this website. The monograph and website provide additional material and background detail about this exercise. However, I have put the material directly used in this exercise on the website associated with this course:
http://personal.strath.ac.uk/gary.koop/BoK_course.html

MATLAB Exercises:
Inflation Persistence in the US
Use the unobserved components model of Stock and Watson (2007) "Why Has U.S. Inflation Become Harder to Forecast?," Journal of Money, Credit and Banking. The program, TVP_AR_SW.m, contains code for the model given in their equations (8) - (11) which we replicate here:

$$\begin{aligned}
\pi_t &= \tau_t + \eta_t, \;\; \eta_t \sim N\left(0, \sigma_t^{\eta}\right) \\
\tau_t &= \tau_{t-1} + \varepsilon_t, \;\; \varepsilon_t \sim N\left(0, \sigma_t^{\varepsilon}\right) \\
\log\left(\sigma_t^{\eta}\right) &= \log\left(\sigma_{t-1}^{\eta}\right) + v_t^{\eta}, \;\; v_t^{\eta} \sim N\left(0, \gamma_1\right) \\
\log\left(\sigma_t^{\varepsilon}\right) &= \log\left(\sigma_{t-1}^{\varepsilon}\right) + v_t^{\varepsilon}, \;\; v_t^{\varepsilon} \sim N\left(0, \gamma_2\right)
\end{aligned}$$

We provide data on three measures of inflation (π_t), CPI inflation, PPI inflation and GDP deflator inflation. Use the code to plot trend inflation (τ_t) and the volatilities σ_t^{η} and σ_t^{ε}. Is there evidence that σ_t^{η} is varying over time? Is there evidence that σ_t^{ε} is varying over time.?
Optional: Stock and Watson (2007) also estimate a model (see their equations (5) and (6)) where state and measurement equation variances are constant ($\sigma_t^{\eta} = \sigma^{\eta}$ and $\sigma_t^{\varepsilon} = \sigma^{\varepsilon}$). You can also consider models where there is stochastic volatility in one equation but not the other (i.e. $\sigma_t^{\varepsilon} = \sigma^{\varepsilon}$ but σ_t^{η} is time varying or $\sigma_t^{\eta} = \sigma^{\eta}$ but σ_t^{ε} is time varying). Modify the code to estimate these models and compare results to the full model.