MACROECONOMICS II 2025
PROBLEM SET III
DUE SUNDAY MAY 18

PROFESSOR KRISTOFFER NIMARK

Instructions: Write up answers neatly using a LaTex editor (or similar program). Hand in answers (in pdf form) and any code used for computations in a zipped folder named using the convention `macro_ps3_your_firstnames.zip`. You may work in groups of up to 3 students. It is enough for one group member to hand in the problem set. Make sure that *all* names and NetIDs of the group members are listed on the front page.

Consider the New Keynesian Model with sticky prices (and flexible prices) as described in Gali's textbook with the simple monetary policy rule

$$i_t = 1.5\pi_t - 0.5\widehat{y}_t$$

and the following parameter values

	Description	Value
φ	Curvature of labor disutility	5
σ	Curvature of consumption utility	3
α	Index of decreasing returns to labor	1/4
ϵ	Elasticity of substitution (goods)	9
θ	Calvo index of price rigidities	3/4
β	Discount factor	0.99
ρ_a	Persistence: technology shocks	0.9
ρ_z	Persistence: demand shocks	0.8
ρ_v	Persistence: monetary shocks	0.8
σ_a	S.d. technology shocks	1
σ_z	S.d. demand shocks	1
σ_v	S.d. monetary shocks	1

(1) Write up Matlab code that solves the model. Assuming that you can observe inflation, output and nominal interest rate (all variables in deviations from steady state), write the solved model in state space form.

(2) The file y_pi_i.mat contains time series of output, inflation and the federal funds rate (detrended) from 1985:Q1 to 2023:Q4. Use the Kalman filter to find and plot an estimate of the productivity process a_t conditional on the observations of output, inflation and interest rates.

(3) How does your estimate of a_t change if you double the variance of the innovation to the productivity process? Explain your finding.

(4) How does your estimate of a_t change if you double the variance of the innovation to the demand shock? (All other parameters as in table.) Explain your finding.