Macroeconomics PhD Problem Set 2

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Note: This file does only contain explanations. All other tasks (the inclusion of varobs, data simulation etc.) are solved in the mod file "AnScho.mod".

Excercise 2

1. Observable variables and shocks

The number of shocks has to be equal to the number of observable variables for a Bayesian estimation. Otherwise the parameters are not uniquely identified. The An and Schorfheide (2007) model includes three observable variables as well as three shocks:

Observable variables: quarter-to-quarter per capita GDP growth rates (YGR), annualized quarter-to-quarter inflation rates (INFL), annualized nominal interest rates (INT).

Shocks: monetary policy shock, government spending, shock, technology growth shock.

3. The intuition behind prior information

In Bayesian estimation the parameters θ are treated as random variables and the data d is fixed. Information contained in the data can be combined with beliefs about the parameters. Therefore prior beliefs are able to include information not contained in the data, either knowledge of the researcher or information of data not included. The aim is to draw conclusions for the conditional probability distribution of the parameters. If the true value of a parameter is suspected to be in a certain range, adjusting the prior allows to put more weight on that area in the estimation. Bayesian methods therefore are a bridge between the calibration approach and Maximum-Likelihood-methods. The distribution chosen for priors are usually the Gaussian, (normal, shifted or inverse) Gamma, Beta or uniform distribution. Additionally one has to make considerations about lower and upper bounds, skewness and the kurtosis of the distribution.

5. The quality of the estimation

The figure shows the prior distributions, the posterior distributions and the true values of the parameters. For a good estimation the posterior distribution should be narrow and close to the true value.

For the parameters τ, ψ_1 and ψ_2 the posterior distribution is wide and not as close to the true value as for the other parameters. Especially for τ and ψ_1 prior and posterior distributions are nearly the same. For $r^{(A)}$ the posterior distribution is also quite wide but closer to the real value than the prior.

For all other parameters the posterior distribution is much more narrow than the prior and close to the real value. So for these parameters this excercise provides a good estimation.