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Structural Macroeconometrics
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Problem Set 2: Bayesian Estimation

1 The Setup

Consider the *decentralized* RBC model with capital and labor taxation discussed and implemented in Dynare in Problem Set 1. Now, we would like to take the model to the data by Bayesian methods.

2 Your Tasks

Q1 The observables that we want to include are output, consumption, government spending, capital tax rate, and labor tax rate. You find the per-capita variables and the tax rates in the mat-file `ps2_data.mat`. Use a first-difference filter for the trending variables to generate the datafile you provide to Dynare (remember to demean the first-differences). For stationary variables use demeaned values as observables.

Q2 Enter the corresponding observation equations into Dynare and provide the datafile and the observed variables.
Hint: Define `y_obs`, `c_obs`, and `g_obs` as log differences. Remember to subtract the steady state of the tax rates when defining `tau_n_obs` and `tau_k_obs`. You can do that using the `steady_state(var)` command. Check Pfeifer (2013) if in doubt.

Q3 Use the prior distributions specified in Table 2 to estimate the model using Bayesian techniques. Use the parameters from Table 1 as starting values for finding the mode.[1] Try to tweak the scaling parameter to get a decent acceptance rate. Using one chain is sufficient. Use at least 50,000 draws (including burnin). When performing the estimation

- Check whether the mode actually is a mode
- Check whether the MCMC has converged
- Compute a conditional variance decomposition at horizon 12 and 20. Check the Dynare Manual if you don't know how to do it.

[1] We simplify the model compared to Problem Set 1. Set the growth factors n and x to zero. β and δ are not used to pin down steady state ratios but just set to the values given in the table.

A Tables and Figures

Table 1: Parameters for Calibration

Parameter	Value	Target
A^*	1	Normalization
α	0.33	Capital Share
δ	0.025	Standard value
β	0.99	Standard value
σ	1	Model-independent evidence
ψ	?	$l^* = 0.33$
ρ_z	0.97	Estimate
σ_z	0.0068	Estimate
χ	0.2038	G/Y of 0.2038
ρ_g	0.98	Estimate
σ_g	0.0105	Estimate
$\bar{\tau}_k$	0.387	Estimate
$\bar{\tau}_n$	0.207	Estimate
ρ^n	0.93	Rough Estimate
ρ_k	0.93	Rough Estimate
σ_{τ_k}	0.0093	Rough Estimate
σ_{τ_n}	0.0022	Rough Estimate

Table 2: Prior Distributions

Parameter	Distribution	Mean	Standard Deviation
ρ_z	Beta	0.7	0.1
ρ_g	Beta	0.7	0.1
ρ_n	Beta	0.7	0.1
ρ_k	Beta	0.7	0.1
σ_{τ_k}	Inverse Gamma	0.01	0.1
σ_{τ_n}	Inverse Gamma	0.01	0.1
σ_g	Inverse Gamma	0.01	0.1
σ_z	Inverse Gamma	0.01	0.1

References

Pfeifer, Johannes (2013). “A guide to specifying observation equations for the estimation of DSGE models”. Mimeo. University of Cologne.