Computational Macro - Problem set 5

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October 21, 2020

Question 1.

Discretization of an AR(1) process using Tauchen (1986) and Rouwenhorst (1995). I use a monte-carlo simulation of the continuous process as comparison.

	Data	Tauchen N=5	Tauchen N=10	Rouwenhorst N=5	Rouwenhorst N=10
mean	-0.138	0.032	-0.085	-0.351	0.284
var	21.072	13.793	12.041	20.176	21.337
skew	-0.018	-0.024	0.026	0.061	0.05
kurt	-0.14	-0.977	-0.955	-0.443	-0.212
1st order acorr	0.901	0.839	0.843	0.895	0.902
2nd order acorr	0.812	0.71	0.712	0.802	0.816
3rd order acorr	0.733	0.603	0.603	0.716	0.737
4th order acorr	0.663	0.512	0.509	0.638	0.665

Table 1: Moments and autocorrelation of AR(1) process

Question 2.

To perform this exercise, I assume a depreciation rate for capital of $\delta = 0.1$ rather than 0.05 and a persistence rate for the AR(1) process of $\rho = 0.8$ rather than 0.9. I do this because the VFI algorithm does not always converge with very high persistence. I use a curved grid for capital with 20 points and $\theta_k = 2$ and I discretize the productivity process with 10 grid points using Rouwenhorst (1995). Throughout the optimization, I never interpolate along the productivity (z) dimension because it is a discrete process but I interpolate the value function along the z dimension once it converged such that I can plot results. It took 723 seconds for the algorithm to converge.

As we can see from both plots, the value function is monotonically increasing in both productivity z and capital k, which is to be expected.

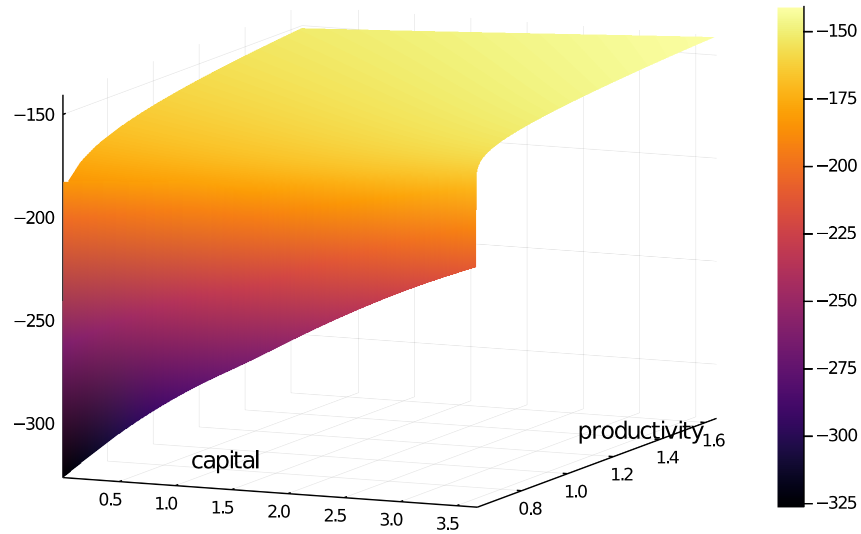

Figure 1: 3d surface plot of the value function - $n_k = 20$ -$\theta_k = 2$ - $n_z = 10$

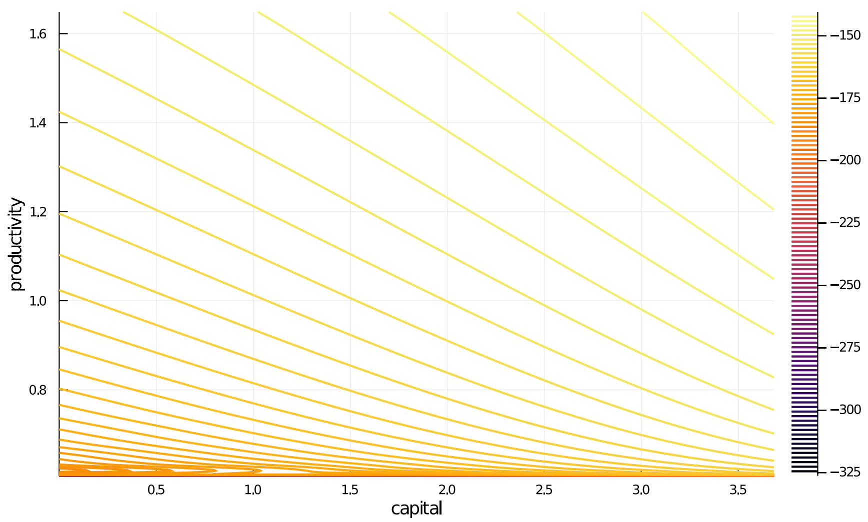

Figure 2: contour plot of the value function - $n_k = 20$ -$\theta_k = 2$ - $n_z = 10$