ECON 5760
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Problem Set 6

Problem 1. Consider the benchmark model with shocks to output with $u(C_t) = \frac{C_t^{1-\eta}-1}{1-\eta}$ and $F(Z_t, K_t) = Z_t K_t^{\alpha}$ with the resource constraint $f(K_t) = C_t + K_{t+1}$ where $f(K_t) = F(Z_t, K_t) + (1-\delta)K_t$.

a. Formulate the Bellman equation for the problem and derive the euler equation.

b. Using the euler equation at the steady-state level consumption (C^*) and capital stock (K^*), solve for the steady-state capital stock for an arbitrary set of parameters η, δ, α, β, and Z_j.

c. Using the function simplevalueitstoch.m solve for the policy function on a grid of size $n = 50$ by simple value function iteration. How long does it take to converge to the terminal solution?

d. We know that for the case in which $\delta = 1$ and $\eta = 1$ that the policy function for capital is given by $h(K, Z) = \alpha\beta Z K^{\alpha}$. Plot the approximate solution $\hat{h}(K, Z)$ against the true solution $h(Z, K)$. Calculate $max|\hat{h}(K, Z) - h(Z, K)|$.

e. Now save the terminal value for the value function v^* as $v0$. Define a new grid of capital stock of size $n = 500$ with the same lower bound and upper bound for capital stock as before. Using the old grid for capital and $v0$, interpolate the value of $v0$ onto the new grid for capital stock of size $n = 500$. How long does value function iteration take to converge with this interpolated value for $v0$? Now graph the approximate solution $\hat{h}(K, Z)$ against the true solution $h(Z, K)$. Calculate $max|\hat{h}(K, Z) - h(Z, K)|$. How does this compare to what you got in part d?