Corporate Problem Set 2

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November 16, 2021

1 Part 1: Steady state values

In this section I derive the values for the steady state, which we will use in Dynare.

The set of equations that characterize the equilibria are the following:

$$q_t = 1 + \psi_I(I_t, k_t) \tag{1}$$
$$q_t = E_t[M_{t+1}(\pi_k(k_{t+1}, z_{t+1}) - \psi_k(I_{t+1}, k_{t+1}) + q_{t+1}(1-\delta))] \tag{2}$$
$$I_t = k_{t+1} - k_t + \delta k_t \tag{3}$$
$$c_t = \pi(k_t, z_t) - \psi(I_t, k_t) - I_t \tag{4}$$
$$z_t = (1-\rho_z) + \rho_z z_{t-1} + \epsilon_t \tag{5}$$
$$M_t = \frac{1}{1+r}\left(\frac{c_t}{c_{t-1}}\right)^{-\gamma}, \tag{6}$$

where:

$$\begin{aligned}
\pi(k_t, z_t) &= z_t k_t^\theta \\
\Rightarrow \pi_k(k_t, z_t) &= \theta z_t k_t^{\theta-1}, \\
\psi(I_t, k_t) &= \psi_0 \frac{(I_t - \delta k_t)^2}{2k_t} \\
\Rightarrow \psi_I(I_t, k_t) &= \psi_0 \frac{I_t - \delta k_t}{k_t} \\
\Rightarrow \psi_k(I_t, k_t) &= -\psi_0 \left(\frac{(I_t - \delta k_t)^2}{2k_t^2} + \delta \frac{I_t - \delta k_t}{k_t}\right).
\end{aligned}$$

From the above, we can solve for the steady state. Let variables without time subscripts denote steady state values.

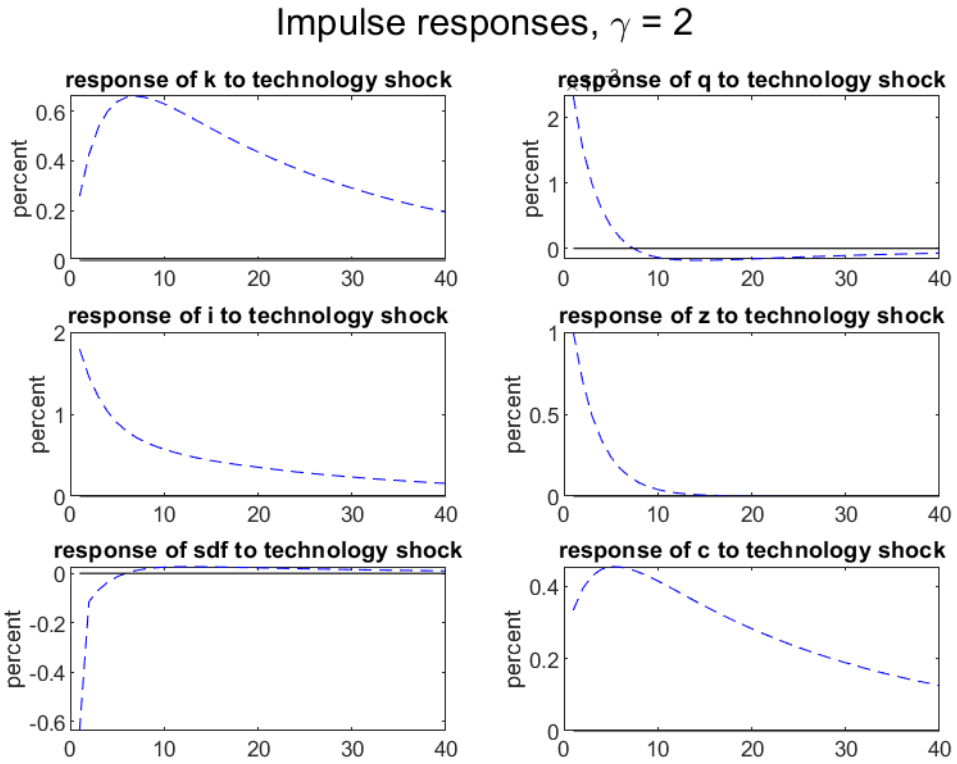
$$\begin{aligned}
z &= 1 \\
M &= \frac{1}{1+r} \\
I &= \delta k \\
q &= 1 \\
c &= k^\theta - \delta k \\
k &= \left(\frac{r+\delta}{\theta}\right)^{\frac{1}{\theta-1}}
\end{aligned}$$

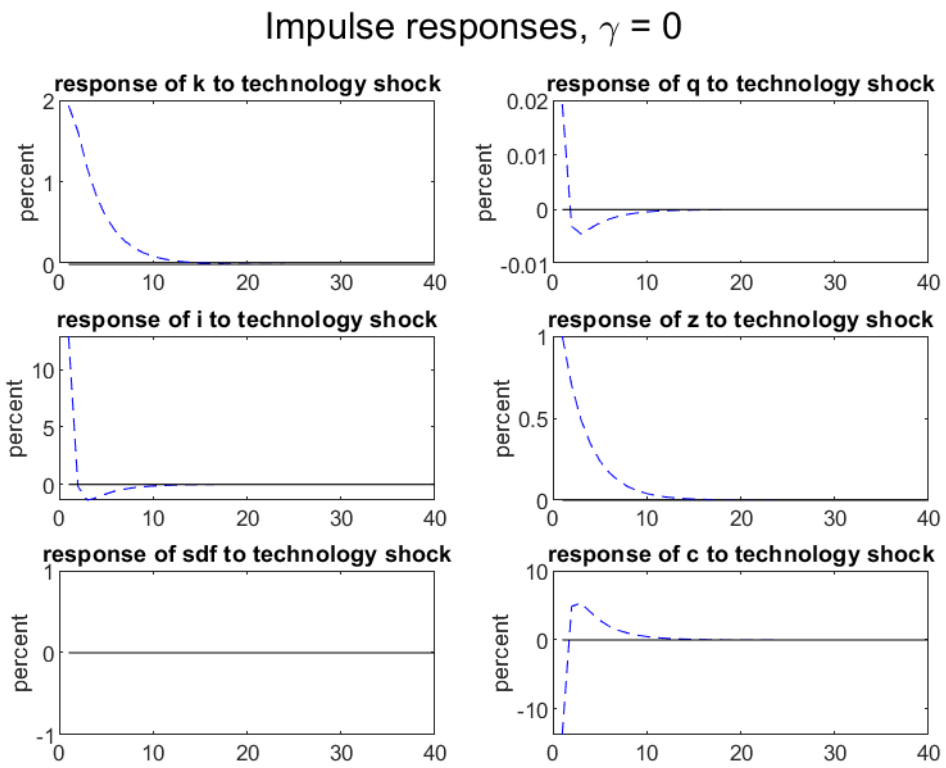
From the given parameterization, we get the following steady state values:

Variable	SS Value
k	77.24
c	9.38
M	0.96
I	11.59
z	1
q	1

2 Part 2: Impulse responses under initial parameterization

In this section we present the impulse responses from our inital parameterization, and under the same parameterization but with $\gamma = 0$.



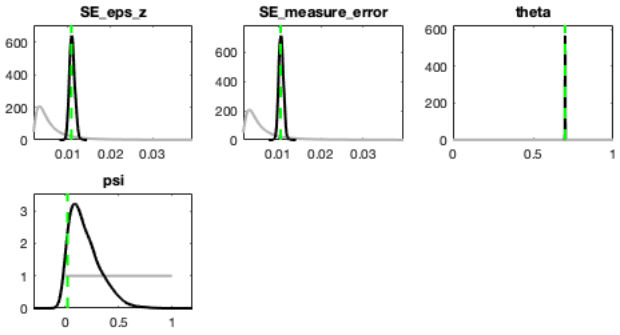


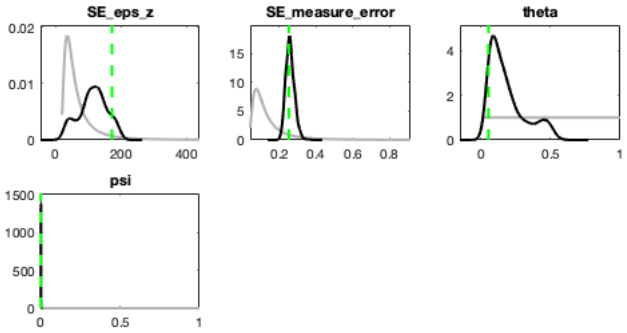
From the above graphs, we can see that, under a realistic parameterization of γ, our impulse responses of capital to a technology shock is smoothly evolving. In comparison, under $\gamma = 0$, our consumer no longer cares about consumption smoothing. They invest immediately to take advantage of technology shock so as to maximize their total consumption. This results in a spike in capital.

Here are our regression results. Beta 2 is positive, as expected.

alpha	8.88
beta 1	-2.49
beta 2	1.8

Prior/posterior plots follow:





Our results show that the posteriors are quite different. This is not remotely surprising. Our DGP in the first estimation is a particular parameterization of the model we are estimating. Our DGP in reality is probably quite different than this parameterized model. Thus we should not be the least bit surprised that our posterior is substantially different.