Problem Set 9

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First, I would like to explain the code and then display the summary of results about replicated first rows of Panel A in Tables 2 and 3 in tabular format. These results will include the point estimates for the parameters we estimate and computed standard errors using the variance-covariance matrix computed by employing the identify matrix as the weighting matrix.

1. Explanation for the Code

The code is almost the same for Table 2 and 3 in terms of the steps performed however, they differ in terms of defined parameters, their values and the form of value function iteration problem. First step employs the given initial values of all the parameters in PS8. Second step is to find the grid points for physical capital, k and approximate the process of productivity z, which is A in the paper with the help of Rouwenhorst (1995) method via `z_fun` function. All the model parameters are defined as theta. As the third step, we defined the same value function iteration likewise in PS8 as a function called `VFI_loop`. Then, operating profits, op and earnings, e are defined and the value function iteration is performed under the `solve_firm` function. The optimal policy function, PF is also obtained in this step. The fifth step includes simulating the Markov process as a function called `sim_markov`. After setting the number of firms and time periods, `loop_k`, `loop_I`, profit and `loop_VFIs` functions are defined in order to gather the simulated data values of physical capital, investment, profit and value functions in the next period, respectively. Then, `sim_firm` function is defined to gather the simulated data values of all variables listed above for the firms. As the sixth step, moments function is defined to get the moments of simulated data. Then, the distance between `mu_s` and `mu_d` is defined under the dist function by using the identity matrix as the weighting matrix. As the seventh step, objective function for simulated method of moments, which will be minimized with respect to theta, is defined under as Qfunc2 function. The bounds for the estimated model

parameters are set. The global minimum of this function is found as `theta_hat`. Then, the variance-covariance matrix is found. As the last step, using this var-cov matrix, standard errors are gathered.

These steps solve for the partial equilibrium of the firms' problem in Tables 2 and 3. All the steps are the same for unconstrained and costly external finance model except the theta and value function defined in step 1.

Step 1 for Unconstrained Model

Given $\theta = (\alpha, \gamma, \rho, \sigma)$, solve for the following dynamic program:

$$V(K, A) = \max_{K^{'}} \pi(K, A) - p(K^{'} - (1-\delta)K) - C(K^{'}, K) + \beta E_{A^{'}|A} V(K^{'}, A^{'})$$

where

$$C(K^{'}, K) = \frac{\psi}{2} \frac{(K^{'} - (1-\delta)K)^2)}{K}$$

and

$$\pi(K, A) = AK^{\alpha}$$

Step 1 for Costly External Finance Model

Given $\theta = (\alpha, \gamma, \rho, \sigma, \phi_0)$, solve for the following dynamic program:

$$V(K, A) = \max(V^e(K, A), V^i(K, A))$$

where

$$V^e(K,A) = \max_{K'>(\pi(K,A)+(1-\delta)K)} \pi(K,A) - p(K^{'} - (1-\delta)K) - C(K^{'},K) - \phi_0 - \phi_1(p(K^{'} - (1-\delta)K) - \pi(K,A)) + \beta E_{A'|A} V(K^{'},A^{'})$$

and

$$V^i(K,A) = \max_{K'>(\pi(K,A)+(1-\delta)K)} \pi(K,A) - p(K^{'} - (1-\delta)K) - C(K^{'},K) + \beta E_{A'|A} V(K^{'},A^{'})$$

Step 2

Finding the optimal policy function from the value function iteration and then, using this policy function to create the simulated dataset.

Step 3

Obtaining $\psi^s(\theta)$ from the simulated panel dataset.

Step 4

Replicating the structural parameters named under θ with the help of simulated method of moments (SMM) estimator by minimizing the following function:

$$\min_{\theta} J(\theta) = (\psi^d - \psi^s(\theta))^{'} W^{-1} (\psi^d - \psi^s(\theta))$$

Structural parameters, θ, are chosen to minimize the distance between the moments generated by data, ψ^d, and those calculated from the simulated data, $\psi^s(\theta)$.

2. Reporting the Results

The following tables show the point estimates for the parameters we estimate and computed standard errors using the variance-covariance matrix computed using the identify matrix as the weighting matrix.

Table 1: Structural Parameter Estimates for Unconstrained Model

	α	γ	ρ	σ
Point Estimates in Table 2	0.699	0.1647	0.111	0.857
Standard Errors in Table 2	(0.01)	(0.017)	(0.007)	(0.029)
Replicated Point Estimates	0.6135	0.091	0.100	0.497
Replicated Standard Errors	(0.203)	(2.63)	(0.005)	(10.42)
Var-Cov Matrix	(0.14)	(0.13)	(0.84)	(0.79)

Table 2: Structural Parameter Estimates for Costly External Finance Model

	α	γ	ρ	σ	ϕ_0
Point Estimates in Table 3	0.6956	0.1331	0.0976	0.8932	0
Standard Errors in Table 3	(0.01)	(0.04)	(0.02)	(0.03)	(0.05)
Replicated Point Estimates	0.571	0.129	0.025	0.599	0.0008
Replicated Standard Errors	(10.8)	(0.008)	(0.046)	(0.632)	(1.311E-6)
Var-Cov Matrix	(0.17)	(0.001)	(0.07)	(0.20)	(0.002)