Entry, Exit, and Firm Dynamics

November 26, 2020

There's no characterization of entry, exit, or the firm life-cycle in the very basic firm dynamics model. To capture these features, we consider the following model.

1 A model with entry and exit

Time period is discrete. Within every period, a firm owns capital, and chooses how much labor to hire for production, and make investment or disinvestment decisions.

At the beginning of the period, a firm can choose whether to continue operation or to exit from the market. To continue operation in this period, the firm should pay a fixed, operating cost c.

Continue Operation

We first consider the case that the firm chooses to continue operation. Assume firm's production function is $f(z,k,l)$. Firm will maximize its profit by hiring labor and pay wage w at a competitive labor market,

$$\pi(z,k) = \max_{l} f(z,k,l) - wl$$

Then this firm decides how much investment i it should make. The capital accumulation follows

$$k' = (1-\delta)k + i$$

and the firm also incurs a capital adjustment cost $\Phi(\cdot)$. For simplicity, we assume a quadratic adjustment cost here

$$\Phi(k',k) = \frac{\phi}{2}\left(\frac{k'}{k} - (1-\delta)\right)^2 k$$

Exit

Now we consider the exit decisions of a firm. When a firm exits from the market, it can sell it's post-depreciation capital and get the scrap value back. That is to say the firm is going adjust its post-depreciation capital to 0, which also faces a capital adjustment cost.

We denote the scrap value as V^x, which is a function of k.

$$V^x(k) = (1-\delta)k - \Phi(0,k)$$

Firm Decision

We denote the value function that firm chooses to continue operating as V^c, and we denote the value function that firm faces at the beginning of a period (before making exit/continuation decisions) as V.

$$V^c(z,k) = \pi(z,k) - c - \left(k' - (1-\delta)k\right) - \Phi\left(k',k\right) + \beta\mathbb{E}_{z'|z}V\left(z',k'\right)$$

and at the beginning of the period, a firm decides whether to stay or to exit,

$$V(z,k) = \max_{\text{stay/exit}}\left\{V^x(k), V^c(z,k)\right\}$$