Investment Theory

Rudi Kurniawan
Department of Economics
Universitas Padjadjaran

Investment is essentially a dynamic problem

The firm's profit function

Profits are given by $\pi(K, X_1, X_2, \ldots, X_n) - r_K K$

where r_K is the nominal rental price the firm pays to use one unit of capital. Thus, the π function must measure profit before subtracting out the cost of capital. Let's call this "operating profit."

The operating profit function.

Think about the simplest possible case: a competitive firm that produces using only capital and labor.

Revenue equal to PQ, where P is the competitive market price of its product and Q is the amount it produces.

The firm's production is constrained by its production function, so $Q = F(K, L)$

In addition to capital costs, the firm incurs labor costs equal to wL, where w is the market wage.

Thus, the firm's profit excluding capital cost (operating profit) is

$P \cdot F(K, L) - wL = R(K, P, w)$

For the competitive firm, the Xs in Romer's profit function are P and w, and the other input, labor.

Profit Maximization

Setting the derivative of the profit function with respect to the amount of capital input equal to zero, that is $\partial\pi/\partial K = 0$.

$$\frac{\partial \pi}{\partial K} = \pi_K = \frac{\partial (P.F(K,L) - wL))}{\partial K}$$

$$= P.F_K(K,L) = r_K$$

See eq. (9.1) in Romer, that $\pi_K(K, X_1, \ldots, X_n) = r_K$.

This is the standard profit-maximization condition: marginal revenue product equals marginal factor cost.

We can rewrite that

$$F_K(K,L) = \frac{r_K}{P}$$

which says that a competitive firm maximizes profit where the marginal product of capital equals the real rental rate on capital.

We can draw the left-hand side as a decreasing function of *K* since the marginal product of capital is assumed to decrease as more capital is employed (given the level of labor).

This means that the *MPK* curve can be interpreted as the real demand curve for capital, with the firm renting capital up to the level where the marginal product equals the real rental price.

The User Cost of Capital

Most capital is not rented but is owned by the firms that use it. We can still think of the cost of capital services as a rental price, but we must figure out what a profit-maximizing owner of capital would charge (herself) for using one year's worth of capital services. This price is what we call the user cost of capital, which is (in equilibrium) equal to the rental price of capital.

To be continued…