MacroEconomia Avanzata
Esercitazione 6
Tobin.

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1   Question 1.

1. Derive the Tobin's q, and draw the phase diagram.

2. Define q and enumerate three interpretations of such a variable. Which of these is the Tobin's q?

3. Discuss the empirical evidence.

4. Discuss the consequences of including financial-market imperfections to the model (**Optional — analytical passages**).

2   Question 2.

Corporations in the Us are allowed to subtract depreciation allowances from their taxable income. The depreciation allowances are based on the purchase price of the capital: a corporation that buys a new capital good at time t can deduct fraction $D(s)$ of the purchase price from its taxable income at time $t + s$. Depreciation allowances often take the for of *straight-line depreciation*: $D(s) = 1/T$ for $s \in [0, T]$, and $D(s) = 0$ for $s > T$, where T is the *tax life* of the capital good.

1. Assume straight-line depreciation. If the marginal corporate income tax rate is constant at τ and the interest rate is constant at i, by how much does purchasing a unit of capital at price of P_K reduce the present value of the firm's corporate tax liabilities as a function of T, τ, i and P_K? Thus, what is the after-tax price of the capital good to the firm?

2. Suppose that $i = r + \pi$ and that π increases with no change in r. How does this affect the after-tax price of the capital good to the firm?

3   Question 3.

Consider the model of investment in Question 1. Describe the effects of each of the following changes, assuming that K, q are initially at their long-run equilibrium value.

1. A war destroys half of the capital stock (unanticipated, permanent);

2. The government taxes returns from owning firms at rate τ (so that a firm's profit per unit of capital for a given K is $(1-\tau)\pi(K(t))$ rather than $\pi(K(t))$) (unanticipated, permanent);

3. The government taxes investment. Specifically, firms pay the government γ for each unit of capital they acquire, and receive a subsidy of γ for each unit of disinvestment (anticipated, permanent);

4. The government will impose a one-time capital levy. Specifically, capital holders will be taxed an amount equal to fraction f of the value of their capital holdings at some time t_1 (anticipated, temporary).

4   Question 4.

Let H denote the stock of housing, I the rate of investment, p_H the real price of housing, and R the rent. Assume that I is increasing in p_H, so that $I = I(p_H)$, with $I'(\cdot) > 0$, and that $\dot{H} = I - \delta H$. Assume also that the rent is a decreasing function of H: $R = R(H)$, $R'(\cdot) < 0$. Finally, assume also that the rental income plus capital gains must equal the exogenous required rate of return, r: $(R + \dot{p}_H)/p_H = r$.

1. Sketch the set of points in (H, p_H) space such that $\dot{H} = 0$, and the set of points such that $\dot{p}_H = 0$;

2. What are the dynamics of H, p_H in each region of the resulting diagram? Sketch the saddle path;

3. Suppose the market is initially in long-run equilibrium, and that there is an unexpected permanent increase in r. What happens to H and p_H?

4. Suppose the market is initially in long-run equilibrium, and that it becomes known that there will be a permanent increase in r at some time t_1. What happens to H and p_H?

5. Are adjustment costs internal or external in this model?

6. Why is the $\dot{H} = 0$ locus not horizontal in this model?

5   Question 5 (Optional).

Consider a firm that is contemplating undertaking an investment with a cost of I. There are two periods. The investment will pay off π_1 in period 1 and π_2 in period 2. π_1 is certain, but π_2 is uncertain. The firm maximises expected profits. Assume the interest rate is zero.

1. Suppose the firm's only choices are to undertake the investment in period 1 or not to undertake it at all. Under what condition will the firm undertake the investment?

2. Suppose the firm also has the possibility of undertaking the investment in period 2, after the value of π_2 is known; in this case the investment pays off only π_2. Is it possible for the condition in (a) to be satisfied but for the firm's expected profits to be higher if it does not invest in period 1 than if it does invest?

3. Define the cost of waiting as π_1, and define the benefit of waiting as $\Pr(\pi_2 < I)E[I - \pi_2 | \pi_2 < I]$. Explain why these represent the cost and the benefit of waiting. Show that the difference in the firm's expected profits between not investing in period 1 and investing in period 1 equals the benefit of waiting minus the cost.