Lecture 10: Markets, Prices, Supply and Demand
See Barro Ch. 6

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Spring, 2016

Clearing Markets

▶ We have several important markets in the macroeconomy

1. Labor market (L, w)

2. Capital rental market (K, r)

3. Goods market (C, P)

4. Bonds market (B, i)

Markets

- What is rented on each market?

    1. Labor market: person-hours

    2. Capital rental market: machine-hours

    3. Goods market: goods

    4. Bonds market: dollars

- Note that we assume households will rent capital to firms

- Households supply capital, labor, bonds, demand consumption, bonds

- Firms supply consumption, bonds, demand labor, capital, bonds

- Use an arbitrary medium of exchange: money/"dollars"

MARKETS

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Prices

- Define price P as *dollars per consumption good*

- This is price in "real terms"

- Then W/P is "person-hours/consumption unit"

- Then R/P is "machine-hours/consumption unit"

- We keep i, "dollars tomorrow for dollars today"

Household Income

- Households have four sources of income
    1. Profit from owning firm
    2. Wages from working
    3. Rental income from capital
    4. Interest income from bonds

Profit from owning firm

- Firms have production function:

$$Y = A \cdot F(K, L)$$

- And profit:

$$\Pi = PY - (WL + RK)$$

- Together, these make profit:

$$\Pi = A \cdot F(K, L)Y - (WL + RK)$$

WAGES FROM WORKING

- Wages to households are WL

Rental income from capital

- (Net) rental income from capital is whatever we're paid minus whatever we lose

- Let δ be the rate at which capital falls apart

- Recall capital is in terms of consumption goods, so δPK is loss

- Then net rental income is $RK - \delta PK$

- And rate of return of owning a unit of capital is $R - \delta P$

- Net income from bonds is iB

Nominal income:

$$\Pi + wL + \left(\frac{R}{P} - \delta\right) PK + iB$$

ASSETS

- Households have three assets

    1. Money M, return: 0

    2. Capital K, return: $R/P - \delta$

    3. Bonds B return i

- No reason to hold money in our model (we'll get to this)

- If people hold both capital and bonds, return must be the same!
$$\frac{R}{P} - \delta = i$$

Nominal income, given $\frac{R}{P} - \delta = i$:

$$\Pi + wL + i(PK + B)$$

Nominal Savings

- Changes in capital, bonds, and money are a source of nominal income:

$$\text{Nominal Savings} = \Delta B + P\Delta K$$

- Where we assume that $\Delta M = 0$.

$$\underbrace{PC}_{\text{Expenditure}} + \underbrace{\Delta B + P\Delta K}_{\text{Savings}} = \underbrace{\Pi + wL + i(B + PK)}_{\text{Income}}$$

- ► PC: Nominal consumption
- ► ΔB: Nominal bond savings
- ► $P\Delta K$: Nominal capital savings
- ► Π: Nominal profit income
- ► wL: Nominal wage income
- ► iB: Nominal bond income
- ► iPK: Nominal capital income

Be able to write and understand this basic equation!!

$$\underbrace{PC}_{\text{Expenditure}} + \underbrace{\Delta B + P\Delta K}_{\text{Savings}} = \underbrace{\Pi + wL + i(B + PK)}_{\text{Income}}$$

Divide by P:

$$\underbrace{C}_{\text{Real Expenditure}} + \underbrace{\frac{\Delta B}{P} + \Delta K}_{\text{Real Savings}} = \underbrace{\frac{\Pi}{P} + \frac{w}{P}L + i(\frac{B}{P} + K)}_{\text{Real Income}}$$

Clearing Labor Markets

▶ Recall again nominal profit:

$$\Pi = PAF(K, L) - wL - RK$$

▶ Or real profit:

$$\frac{\Pi}{P} = AF(K, L) - \frac{w}{P}L - \frac{R}{P}K$$

MAXIMIZING PROFIT

- $\frac{\partial \Pi/P}{\partial L}$

$$\frac{\partial \Pi/P}{\partial L} = \frac{\partial AF(K,L)}{\partial L} - \frac{\partial \frac{w}{P}L}{\partial L} - \frac{\partial \frac{R}{P}K}{\partial L}$$

If profit is maximized, then a change in L won't change profit:

$$0 = AF_L(K,L) - \frac{w}{P}$$

$$AF_L(K,L) = \frac{w}{P}$$
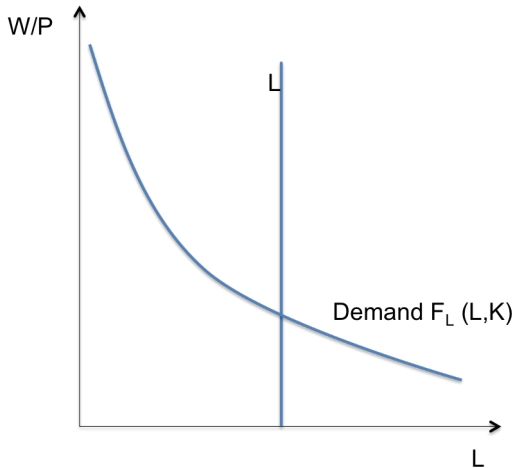
This is the labor demand function

- Similarly, $\frac{\partial \Pi/P}{\partial K}$ gives:
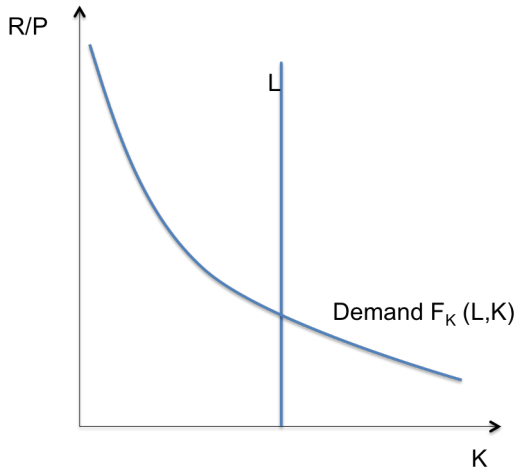
$$AF_K(K,L) = \frac{R}{P}$$

This is the capital demand function

LABOR MARKET CLEARING

Demand $F_L(L, K)$

Labor market clearing

Summarizing

- This may have been painful and boring

- Understanding the budget constraint and tweaks to it will take up the next few chapters

$$\underbrace{PC}_{Expenditure} + \underbrace{\Delta B + P\Delta K}_{Savings} = \underbrace{\Pi + wL + i(B + PK)}_{Income}$$

- Every outflow is also an inflow

- Income to firms is income to households

- In the end, someone consumes the good, so what is made must be eaten (so to speak)