Investment

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Investment

Business fixed investment - equipment and structures for production.

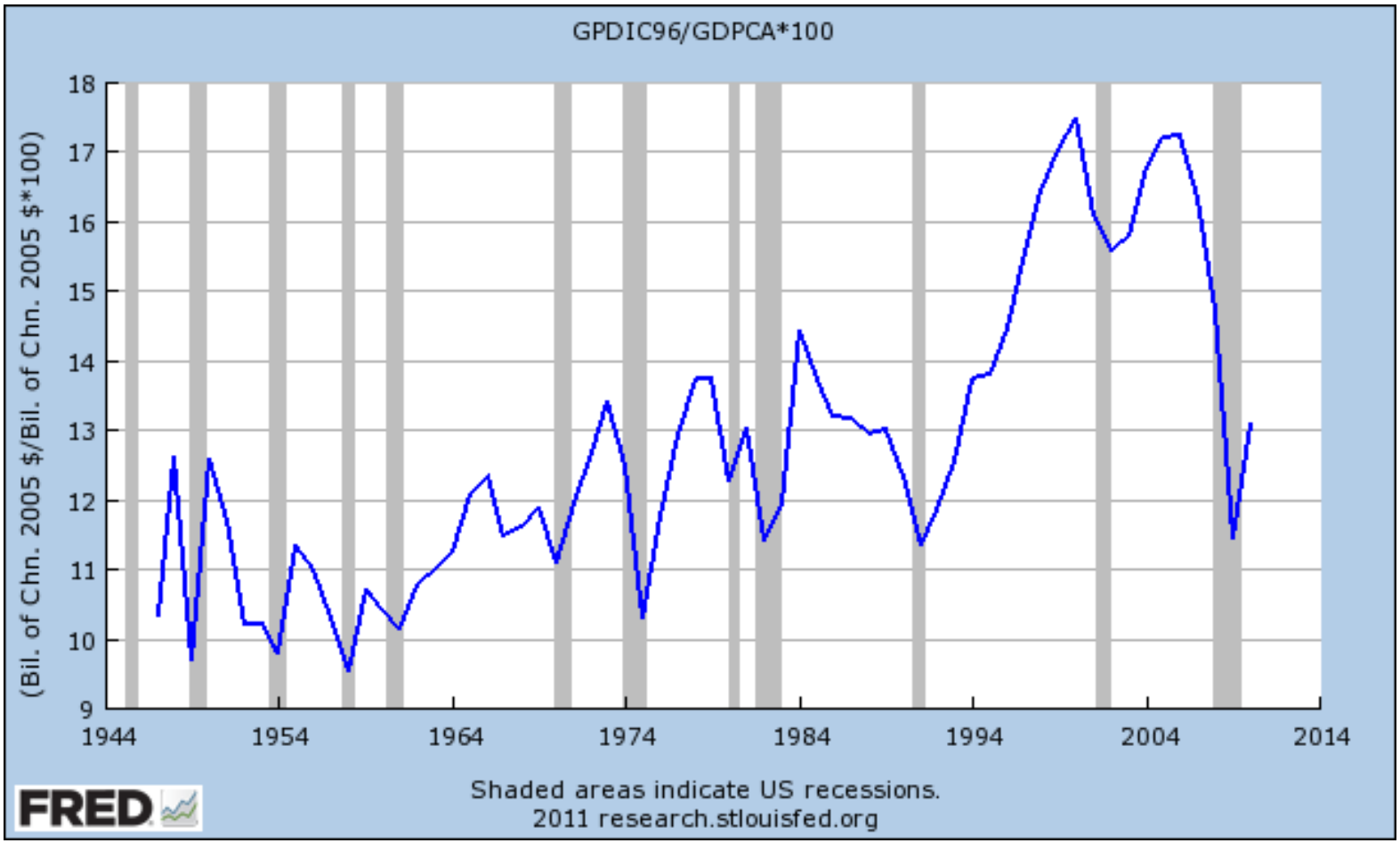
Residential investment - new housing.

Inventory investment - changes in inventories.

We study investment because:

- It is a significant part of GDP (10-20%)
- It plays important role in the business cycle (in the typical recession accounts for more than 50% of total decline in spending))
- It is the source of future growth

Investment Rate in the U.S.



Business fixed investment

Neoclassical Theory of Investment

Two types of firms:

- Production firms: produce goods and services using rented capital

- Rental firms: buy capital and rent it out

Real firms in economy usually perform both tasks. Households can also play the second role.

Rental Price of Capital

Marginal product of capital is equal to its real rental price.

$$Y = AK^{\alpha}L^{1-\alpha}$$

$$R/P = MPK = A(L/K)^{1-\alpha}$$

Real rental price of capital is higher:

- The lower is the stock of capital K
- The greater is the amount of labor L
- The better is the technology A

The Cost of Capital

Consider a rental firm. There are three costs of owning capital:

1. **Interest cost**. Purchase price of capital is P_K; nominal interest rate is i, the interest cost is iP_K. Directly (loan) or indirectly (opportunity cost).

2. **Price cost**. Price of capital may change, the firm looses $-\triangle P_K$.

3. **Depreciation**. The rate of depreciation is δ, cost of depreciation is δP_K

$$\text{Cost of Capital} = P_K(i - \triangle P_K/P_K + \delta)$$

Example: How to Calculate Cost of Capital

A company buys a building at the purchase price of 100 000 USD. The interest rate is 8%, the depreciation rate is 5% and real estate prices are rising at 1% per year. What is the annual cost of owning this building?

Interest cost = 100 000 * 0.08 = 8 000

Price cost = - 100 000 * 0.01 = - 1 000

Depreciation cost = 100 000 * 0.05 = 5 000

Cost of Capital = 8 000 - 1 000 + 5 000 = 12 000

Cost of Capital, cont.

$$\text{Cost of Capital} = P_K(i - \triangle P_K/P_K + \delta)$$

Assume the price of capital rises with the prices of other goods. Then $\triangle P_K/P_K$ is inflation π.

$$\text{Cost of Capital} = P_K(i - \pi + \delta) = P_K(r + \delta)$$

$$\text{Real Cost of Capital} = P_K/P(r + \delta)$$

The Determinants of Investment

Profit Rate = R/P - $P_K/P(r+\delta)$

Profit Rate = MPK - $P_K/P(r+\delta)$

If the marginal product of capital is higher than the cost, net investment is positive.

Investment function: $I = I_n[MPK - P_K/P(r+\delta)]$

In the long run, when capital is in the steady state:

$MPK = P_K/P(r+\delta)$

Some Notes on Investment

- Investment takes time to plan.

- Investment tends to be irreversible, costly to change.

- Firms are forward-looking. If interest rates fall today, I may not invest today because I believe interest rates can be even lower tomorrow.

- Investment returns are uncertain (returns are in the future - which is unknown). As economic uncertainty increases, investment decisions can become delayed.

- Firms, like individuals, may be financially constrained. The role of banks in the economy may be important. Financial constraints means that it is costly to access external finance.

Taxes on capital (on accounting profits) decrease marginal productivity of capital and incentives to invest.

Tobin's Q

Investment is closely related to stock market. Stock prices reflect incentives to invest.

James Tobin:

$$q = \frac{Market\,Value\,of\,Installed\,Capital}{Replacement\,Cost\,of\,Installed\,Capital}$$

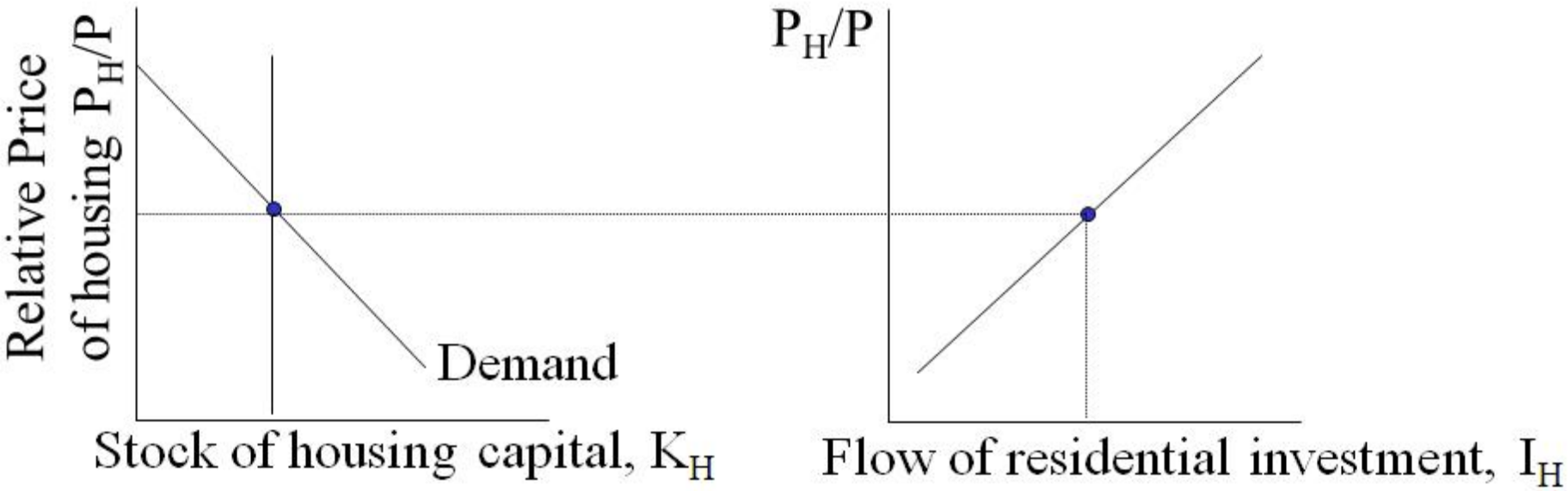
If $q > 1$, firm should invest.

Tobin's q-theory of investment takes into account expected future profitability of capital.

Residential investment

Market for Residential Investment

Market for existing stock determines housing price. Housing price in turn determines the flow of residential investment.



Residential Investment: Some Comments

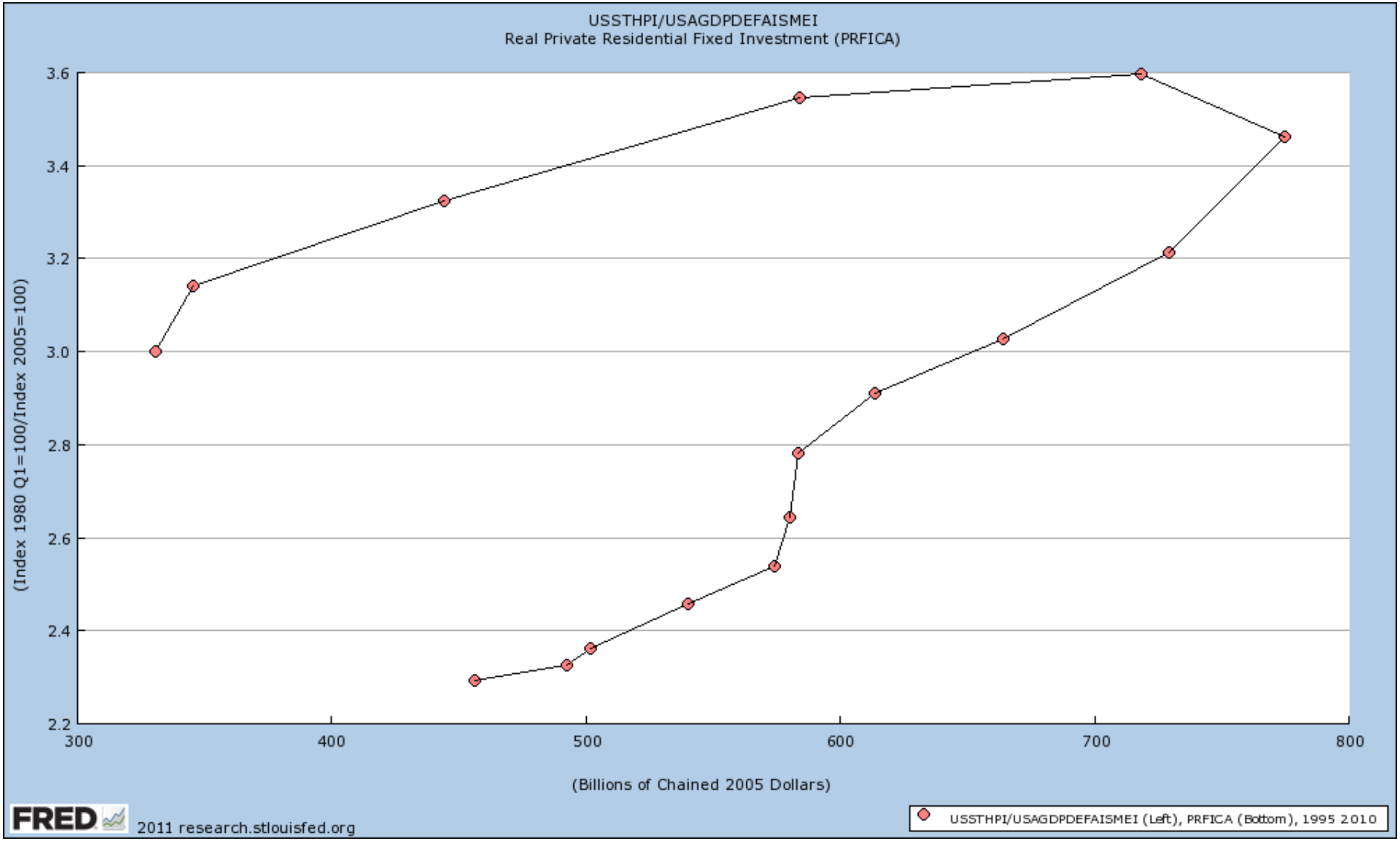
- Lower interest rates stimulate demand for housing and increase residential investment.

- In many countries residential investment is tax-exempt. Given that business investment is often not, it may create a disproportional shift from business into residential investment.

- Financial development generates higher demand for housing.

- Expectations of future housing prices also matter.

Residential Investment in the U.S., 1995-2010



Inventory Investment

Why Hold Inventories?

Sales are volatile. Inventories help smooth out production.

Inventories can be factors of production. The larger the stock, the more output the firm can produce.

To avoid stocking-out.

As part of the production process - components are counted as part of inventory.

Accelerator Model

Stock of inventories is proportionate to the level of output.

$N = \beta Y$

Investment is the change in the stock of inventories. $I = \triangle N = \beta \triangle Y$

$\triangle Y$ is "acceleration" of production.

Interest Rate and Inventories

Interest rate still matters.

Instead of holding inventories, the firm could have sold it and put the money in the bank - opportunity cost.