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## Consumption, Saving, and Investment, Part 2

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## Agenda

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- Investment
  - Goods Market Equilibrium
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## Investment

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- From the desired capital stock to investment:
    - The capital stock changes from 2 sources.
      - **Gross investment**, which adds to the capital stock.
      - **Depreciation**, which reduces the capital stock.
    - Gross investment = net investment + depreciation.
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## Investment

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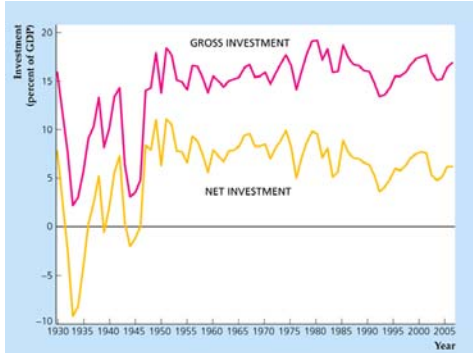
- From the desired capital stock to investment:
  - Net investment = gross investment – depreciation:

$$K_{t+1} - K_t = I_t - dK_t$$

- where net investment = the change in the capital stock.
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## Gross and net investment, 1929-2005



6-5

## Investment

- From the desired capital stock to investment:

➤ Rewrite

$$K_{t+1} - K_t = I_t - dK_t$$

➤ as

$$I_t = K_{t+1} - K_t + dK_t$$

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## Investment

- From the desired capital stock to investment:

➤ If firms can change their capital stocks in one period, then:

$$K^* = K_{t+1}$$

- where  $K^*$  is the desired capital stock.

➤ Then

$$I_t = K^* - K_t + dK_t$$

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## Investment

- From the desired capital stock to investment:

➤ Now investment has two parts:

$$I_t = K^* - K_t + dK_t$$

- $K^* - K_t$ , the desired net increase in the capital stock over the year, and
- $dK_t$ , the investment needed to replace depreciated capital.

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## Investment

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- From the desired capital stock to investment:
  - Lags and investment.
    - Some capital can be constructed easily, but other capital may take years to put in place.
    - So investment needed to reach the desired capital stock may be spread out over several years.

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## Investment

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- Investment in inventories and housing:
  - The marginal product of capital and user cost of capital also apply to housing and inventories as well as to equipment and structures.

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## Determinants of Desired Investment

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- Desired investment will:
  - Increase with an increase in the **expected future marginal product of capital,  $MPK^e$** , because the desired capital stock increases.
  - Decline with an increase in the **price of capital** which also increases the user cost of capital and reduces the desired capital stock.

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## Determinants of Desired Investment

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- Desired investment will:
  - Decline with an increase in the **real interest rate** which also increases the user cost of capital and reduces the desired capital stock.
  - Decline with an increase in the **effective tax rate** which also increases the tax-adjusted user cost of capital and reduces the desired capital stock.
  - Decline with an increase in depreciation rates.

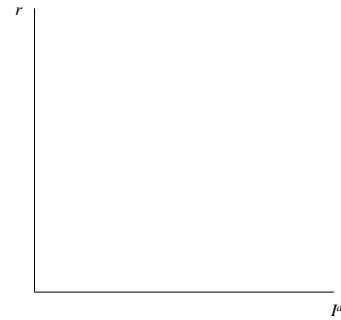
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## Determinants of Desired Investment

- Desired investment will:
  - Decline with an increase in **depreciation rates**, which also increases the tax-adjusted user cost of capital and reduces the desired capital stock.
  - Decline with an increase in the **price of capital**, which also increases the user cost of capital and reduces the desired capital stock.

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## Desired Investment & the Real Interest Rate



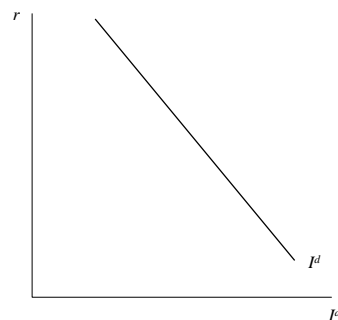
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## Desired Investment & the Real Interest Rate

- Shifts of the investment curve:
  - The investment curve shifts right because of:
    - a rise in expected future marginal product of capital,
    - a fall in the effective tax rate,
    - a decline in depreciation rates, or
    - a decline in the price of capital.

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## Effect of an increase in $MPK^f$



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## Goods Market Equilibrium

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- The real interest rate adjusts to bring the goods market into equilibrium:

$$Y = C^d + I^d + G$$

- This is goods market equilibrium condition.
- This differs from the income-expenditure identity.

$$Y = C + I + G$$

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## Goods Market Equilibrium

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- The goods market need not be in equilibrium.
  - If undesired goods are produced, the goods market will NOT be in equilibrium.

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## Goods Market Equilibrium

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- The income-expenditure identity is:

$$Y = C + I + G$$

- The goods market equilibrium condition is:

$$Y = C^d + I^d + G$$

- or

$$I^d = Y - C^d - G$$

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## Goods Market Equilibrium

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- Now

$$I^d = Y - C^d - G$$

- and (by definition):

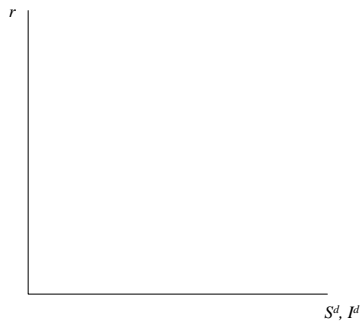
$$S^d = Y - C^d - G$$

- So the goods market equilibrium is also:

$$S^d = I^d$$

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## Goods Market Equilibrium



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## Goods Market Equilibrium

- Establishing goods market equilibrium:
  - Equilibrium where  $S^d = I^d$ .
  - If  $S^d > I^d$ , then  $r$  will decrease until  $S^d = I^d$ .
  - If  $S^d < I^d$ , then  $r$  will increase until  $S^d = I^d$ .

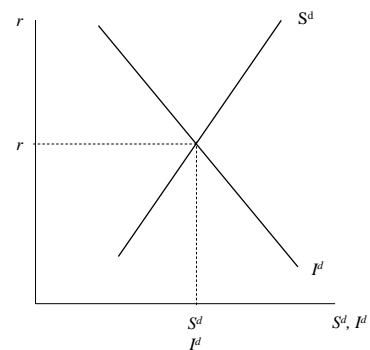
6-22

## Goods Market Equilibrium

- Shifts of the **saving curve,  $S^d$** :
  - The saving curve shifts right because of:
    - A rise in current output,
    - A fall in expected future output,
    - A fall in wealth,
    - A fall in government purchases, or
    - A rise in taxes (unless Ricardian equivalence holds, in which case tax changes have no effect)

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## A decrease in desired savings



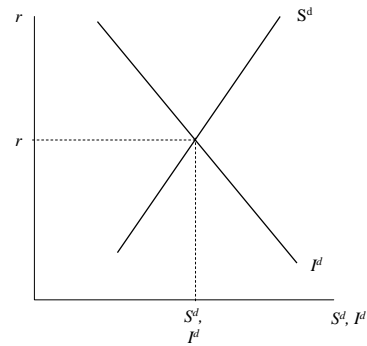
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## Goods Market Equilibrium

- Shifts of the **investment curve,  $I^d$** :
  - The investment curve shifts right because of:
    - A rise in expected future marginal product of capital,
    - A decrease in the price of capital, or
    - A decrease in the effective tax rate.

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## An increase in desired investment



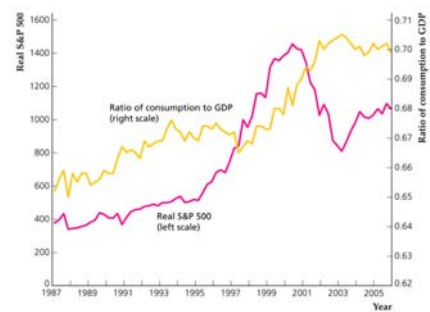
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## Goods Market Equilibrium: Application

- Macroeconomic consequences of a boom and bust in stock prices.
  - Sharp changes in stock prices affect:
    - Consumption via a wealth effect, and
    - Business investment via the price of capital or Tobin's  $q$ .

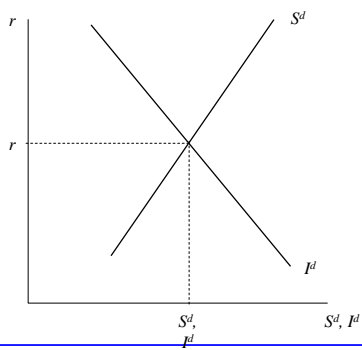
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## Real stock prices and the C/GDP ratio



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## Effect on consumption of 1987 stock crash



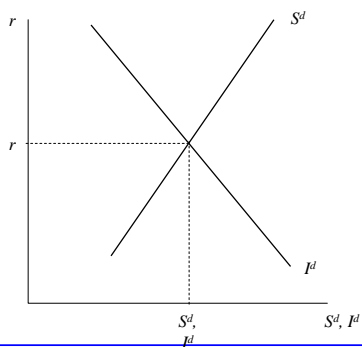
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## Goods Market Equilibrium

- The boom and bust in stock prices:
  - Consumption and the 1987 stock crash.
    - The stock market crash of 1987 reduced wealth by about \$1 trillion.
    - Consumption fell somewhat less than expected and not enough to cause a recession.
      - Probably because there had been a large run-up in stock prices between December 1986 and August 1987, so the crash mostly erased this run-up.

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## Effect on consumption of 1990s stock boom



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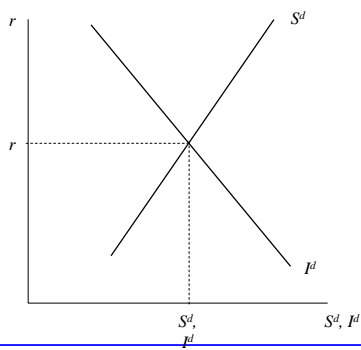
## Goods Market Equilibrium

- The boom and bust in stock prices:
  - Consumption and the 1990s stock boom.
    - Stock prices more than tripled in real terms.
    - Consumption was not strongly affected by the run-up in stock prices

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### Effect on consumption of 2000s stock crash



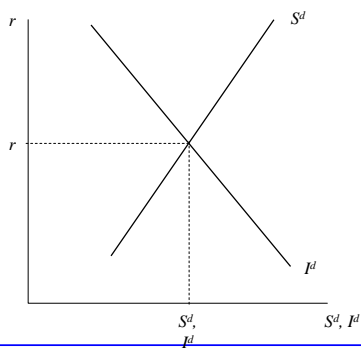
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### Goods Market Equilibrium

- The boom and bust in stock prices:
  - Consumption and the early 2000s stock crash.
    - In the early 2000s, the decline in the stock market reduced wealth by about \$5 trillion.
    - But consumption actually increased as a share of GDP.

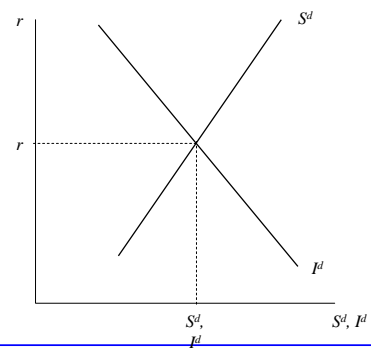
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### Effect on investment of 1990s stock boom



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### Effect on investment of 2000s stock crash



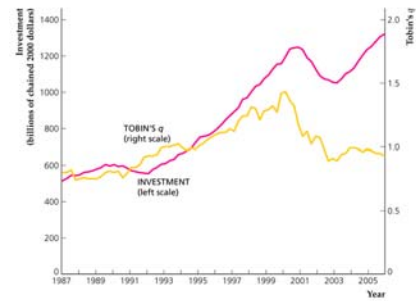
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## Goods Market Equilibrium

- The boom and bust in stock prices:
  - Investment and Tobin's  $q$ .
    - Investment and Tobin's  $q$  were not closely correlated following the 1987 crash in stock prices.
    - But the relationship has been tighter in the 1990s and early 2000s, as the theory suggests.

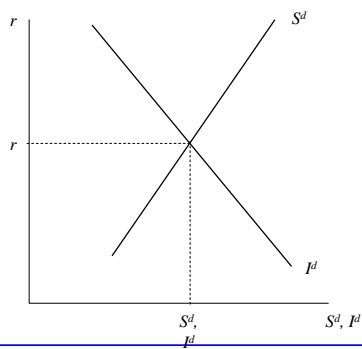
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## Investment and Tobin's $q$ , 1987-2005



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## Key Diagram #3: Goods Market Equilibrium



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## Key Diagram #3: Goods Market Equilibrium

- Goods market equilibrium is given by:

$$Y = C^d + I^d + G$$

- OR

$$I^d = Y - C^d - G$$

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### Key Diagram #3: Goods Market Equilibrium

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- If

$$I^d = Y - C^d - G$$

- and

$$S^d = Y - C^d - G$$

- then:

$$S^d = I^d$$

- which is also **goods market equilibrium**.

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### Key Diagram #3: Goods Market Equilibrium

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- Factors that Shift the Curves:

➤ Changes in these factors will shift the  $S^d$  curve:

- Current income,
- Expected future income,
- Wealth,
- Expected real interest rate,
- Government purchases, and/or
- Taxes.

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### Key Diagram #3: Goods Market Equilibrium

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- Factors that Shift the Curves:

➤ Changes in these factors will shift the  $I^d$  curve:

- Expected future marginal product of capital,
- The effective tax rate,
- The depreciation rate, and/or
- The price of capital.

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