CHAPTER 18 Investment

Questions for Review

1. In the neoclassical model of business fixed investment, firms will find it profitable to add to their capital stock if the marginal product of capital is greater than the cost of capital. The cost of capital depends on the real interest rate, the depreciation rate, and the relative price of capital goods.

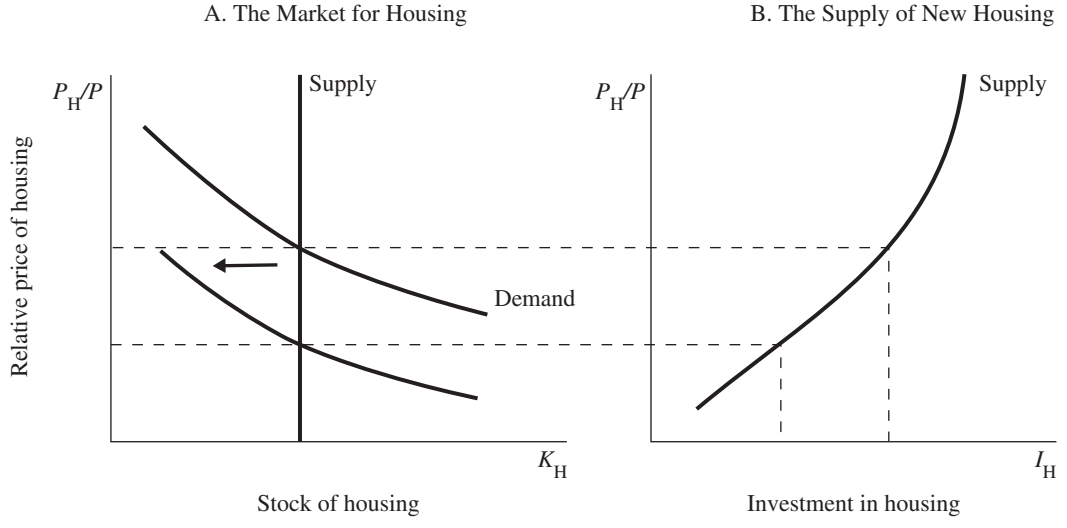
2. Tobin's q is the ratio of the market value of installed capital to its replacement cost. Tobin reasoned that net investment should depend on whether q is greater or less than one. If q is greater than one, then the stock market values installed capital at more than it costs to replace. This creates an incentive to invest, because managers can raise the market value of their firms' stock by buying more capital. Conversely, if q is less than one, then the stock market values installed capital at less than its replacement cost. In this case, managers will not replace capital as it wears out.

   This theory provides an alternative way to express the neoclassical model of investment. If the marginal product of capital exceeds the cost of capital, for example, then installed capital earns profits. These profits make the firms desirable to own, which raises the market value of these firms' stock, implying a high value of q. Hence, Tobin's q captures the incentive to invest because it reflects the current and expected future profitability of capital.

3. An increase in the interest rate leads to a decrease in residential investment because it reduces housing demand. Many people take out mortgages to purchase their homes, and a rise in the interest rate increases the cost of the loan. Even for people who do not borrow to buy a home, the interest rate measures the opportunity cost of holding their wealth in housing rather than putting it in the bank.

   Figure 18–1 shows the effect of an increase in the interest rate on residential investment. The higher interest rate shifts the demand curve for housing to the left, as shown in Figure 18–1(A). This causes the relative price of housing to fall, and as shown in Figure 18–1(B), the lower relative price of housing decreases residential investment.

Figure 18–1



4. Reasons why firms might hold inventories include:
   a. **Production smoothing**. A firm may hold inventories to smooth the level of production over time. Rather than adjust production to match fluctuations in sales, it may be cheaper to produce goods at a constant rate. Hence, the firm increases inventories when sales are low and decreases them when sales are high.
   b. **Inventories as a factor of production**. Holding inventories may allow a firm to operate more efficiently. For example, a retail store may hold inventories so that it always has goods available to show customers. A manufacturing firm may hold inventories of spare parts to reduce the time an assembly line is shut down when a machine breaks.
   c. **Stock-out avoidance**. A firm may hold inventories to avoid running out of goods when sales are unexpectedly high. Firms often have to make production decisions before knowing how much customers will demand. If demand exceeds production and there are no inventories, the good will be out of stock for a period, and the firm will lose sales and profit.
   d. **Work in process**. Many goods require a number of steps in production and, therefore, take time to produce. When a product is not completely finished, its components are counted as part of a firm's inventory.

Problems and Applications

1. In answering parts (a) to (c), it is useful to recall the neoclassical investment function:

$$I = I_n[MPK - (P_K/P)(r + \delta)] + \delta K.$$

   This equation tells us that business fixed investment depends on the marginal product of capital *(MPK*), the cost of capital $(P_K/P)(r + \delta)$, and the amount of depreciation of the capital stock (δK). Recall also that in equilibrium, the real rental price of capital equals the marginal product of capital.
   a. The rise in the real interest rate increases the cost of capital$(P_K/P)(r + \delta)$. Investment declines because firms no longer find it as profitable to add to their capital stock. Nothing happens immediately to the real rental price of capital, because the marginal product of capital does not change.
   b. If an earthquake destroys part of the capital stock, then the marginal product of capital rises because of diminishing marginal product. Hence, the real rental price of capital increases. Because the *MPK* rises relative to the cost of capital (which does not change), firms find it profitable to increase investment.
   c. If an immigration of foreign workers increases the size of the labor force, then the marginal product of capital and, hence, the real rental price of capital increase. Because the *MPK* rises relative to the cost of capital (which does not change), firms find it profitable to increase investment.

2. Recall the equation for business fixed investment:

$$I = I_n[MPK - (P_K/P)(r + \delta)] + \delta K.$$

   This equation tells us that business fixed investment depends on the marginal product of capital, the cost of capital, and the amount of depreciation of the capital stock.

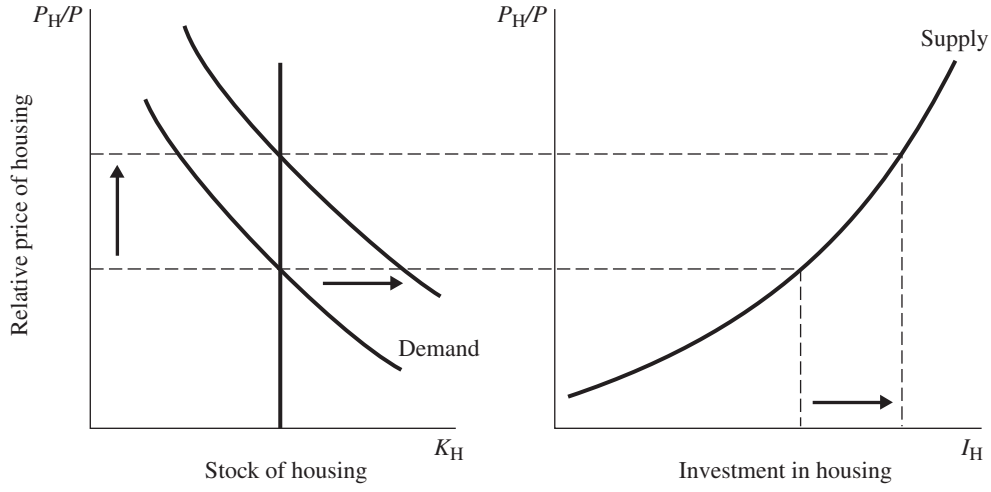
   A one-time tax levied on oil reserves does not affect the *MPK*: the oil companies must pay the tax no matter how much capital they have. Because neither the benefit of owning capital (the *MPK*) nor the cost of capital are changed by the tax, investment does not change either.

   If the firm faces financing constraints, however, then the amount it invests depends on the amount it currently earns. Because the tax reduces current earnings, it also reduces investment.

3. a. There are several reasons why investment might depend on national income. First, from the neoclassical model of business fixed investment we know that an

6. a. In the 1970s, the baby-boom generation reached adulthood and started forming their own households. This implies that in our model of residential investment, demand for housing rose. As shown in Figure 18–3, this causes housing prices and residential investment to rise.

Figure 18–3



b. The *Economic Report of the President 2009* (Table B–7) reports that in 1970, the real price of housing—the ratio of the residential investment deflator to the GDP deflator—was 21.53/27.54, or 0.78. In 1980, this ratio had risen to 51.39/54.06, or 0.95. Thus, between 1970 and 1980 the real price of housing rose 22 percent. This finding is consistent with the prediction of our model.