Answers to Questions: Chapter 15

1. The data in Section 15-2 show that residential investment as a share of natural GDP, on average, did not change considerably between 1960 and 2000. Since 2000, residential investment first rose as a share of natural GDP during the housing boom and then shrunk as a share of natural GDP following the collapse of housing prices. Investment in nonresidential structures has become a smaller share of natural GDP over the last 50 years, declining from 4 percent of natural GDP to 3 percent of natural GDP in the years just prior to the onset of the Global Economic Crisis. Investment in durable equipment and software has become a larger share of the economy's output over time, rising from 6.9 percent of natural GDP in the late 1960s to 8.7 percent of natural GDP at the end of the 1990s, and remaining at 8.0 percent of natural GDP in the years leading up to the Global Economic Crisis. Finally, inventory investment has become as smaller share of natural GDP as businesses have learned how to better manage their inventories.

   Figure 15-1 clearly indicates that are four components of gross private domestic investment are quite volatile over the business cycle. While inventory investment has become a smaller share of the economy's output, it still is quite volatile, particularly as the economy turns from expansion to recession or recession to expansion. Residential investment is the most volatile of the three remaining components and typically turns before the rest of the economy does so.   Investment in nonresidential structures is not quite as volatile as residential investment and investment in durable equipment and software, while still volatile over the course of the business cycle, is the most stable component of gross private domestic investment.

2. Net investment is the amount by which the capital stock changes during a period of time, usually a year. Gross investment measures the total production of capital goods within a period of time. Gross investment cannot be negative; the minimum value is zero. On the other hand, net investment will be negative when the size of the capital stock declines (when the amount of capital consumption allowance or depreciation is greater than gross investment).

3. No, it does not. If output is growing, the desired capital stock is also rising in the simple accelerator model, and there will be positive net investment. But investment is the change in the capital stock, and once the desired capital stock begins to grow at a *slower* rate, the rate of investment, though positive, declines.

4. Two assumptions of the simple accelerator model change when we account for lags. These assumptions are: (1) expected sales are equal to output of the previous period, and

(2) actual capital stock is equal to desired capital stock. Using an adaptive hypothesis for expected sales and a production lag for actual capital stock does not change the general results of the accelerator model, but it does cause the effects of any disturbances to be distributed over a longer time period.

5. The net investment ratio is described as volatile because it has fluctuated quite a bit over the years and at times has shifted by several percentage points in a fairly short time. The ratio is described as persistent because there have been periods when the ratio has remained relatively high or relative low for several years in a row. The best example of the latter case is the Great Depression, when net investment was negative for the entire decade.

6. When business persons become more confident, they expect that purchases of an extra machine today will yield more profits tomorrow, so they are more likely to buy the machine. In the language of the model, business and consumer confidence alters the calculation of the future expected profits (future expected marginal product of capital). Some projects that have been rejected because their *MPK*s are less than their user costs will now be desirable.

7. The three costs are: (1) interest costs involved in buying the capital good, (2) physical deterioration of the capital good (depreciation rate), and (3) rising market value of used capital goods during periods of inflation or capital-good shortages. The one cost over which policymakers have some control is the interest rate.

8. The three tools are: (1) the corporate income tax, (2) depreciation allowances, and (3) investment tax credits. Using these tools to make investment more attractive is likely to have only a temporary effect on investment. For example, increasing the investment tax credit will lower the user cost of capital and will lead to a higher desired level of capital. The resulting gap between desired capital and actual capital will require an increase in investment; however, once that gap has been filled, there will no longer be a stimulus to net investment.

9. First, because changes in tax incentives are usually subject to lengthy debate in Congress, there is a possibility of perverse effects taking place during the debate. Second, there is a substantial time lag between the passage of tax legislation and the actual investment spending. Third, it would be difficult to determine the correct size incentive to use because economists disagree about the quantitative effect of tax incentives for investment.

10. a. The decline in defense spending reduces aggregate demand, other things being equal, that would result in declines in output, the inflation rate, and the real interest rate, as well as a rise in the unemployment rate. However, since monetary policymakers take

steps to prevent a change in either the unemployment or inflation rate, they lower the real interest rate enough to keep the output ratio at 100. The decline in the real interest rate reduces the user cost of capital. That decrease in the user cost of capital increases the desired ratio of capital to expected output, which in turn results in a higher level of net investment. It is the higher level of net investment which results in the output ratio remaining at 100 despite the drop in defense spending.

b. The fact that the contractionary effects of the cuts in government spending outweigh the expansionary effects of the cuts in personal and corporate taxes means that this change in fiscal policy reduces aggregate demand. Therefore, as in Part a, the contractionary effect of fiscal policy allows monetary policymakers to take actions that reduce the user cost of capital. The cut in the corporate income tax rate also reduces the user cost of capital. Therefore, as in Part a, the decrease in the user cost of capital increases the desired ratio of capital to expected output, which in turn results in a higher level of net investment. It is the higher level of net investment which results in the output ratio remaining at 100 despite the combined effects of the cuts in taxes and government spending on aggregate demand.

c. An investment tax credit by itself would lower the user cost of capital and therefore raise the desired ratio of capital to expected output. That in turn would raise investment expenditures and stimulate aggregate demand. However, monetary policymakers react to the increase in aggregate demand by raising the real interest rate in order to prevent a rise in the inflation rate. Therefore, any decrease in the user cost of capital due to the investment tax credit is offset by an increase in the real interest rate that is sufficient to keep the user cost of capital constant.

d. Since the increase in health care spending is only partially paid for by an increase in the tobacco tax, this change in fiscal policy results in an increase in aggregate demand. That by itself would result in a higher real interest rate and an increase in the user cost of capital. But there is an additional rise in the real interest rate as monetary policymakers take actions to offset the expansionary effect of the change in fiscal policy on aggregate demand and the inflation rate. Therefore, the rise in the real interest rate increases the user cost of capital. The increase in the user cost of capital decreases the desired ratio of capital to expected output, which in turn results in a lower level of net investment. It is the lower level of net investment which results in the output ratio remaining at 100 in the face of expansionary fiscal policy.

e. If the output ratio were below 100, then monetary policymakers could take actions to reduce the real interest rate even more in response to the fiscal changes described in Parts a and b. However, if the output ratio were below 100, monetary policymakers would not necessarily feel a need to raise the real interest rate when the investment tax credit is enacted. Therefore, the enactment of the investment tax credit would

reduce the user cost of capital. The reduction in the user cost of capital would increase the desired ratio of capital to expected output, which in turn would result in a higher level of net investment. It is the higher level of net investment which would move the output ratio towards 100. Monetary policymakers would take actions to raise the real interest rate only if the increase in investment expenditures pushed the output ratio above 100. Finally, if the output ratio were below 100, monetary policymakers might well be willing to take actions to prevent the expansionary effects of the changes in health care spending from causing a rise in the real interest rate, thereby preventing that change in fiscal policy from having impacts on the user cost of capital, the desired ratio of capital to expected output, and the level of net investment.

11. There are four major factors identified in the text. The first is the ability to close the gap between desired and actual capital in a single period. The greater the ability to close the gap, the greater the response of current investment to changes in output. The second factor is how business firms adjust their expectations of output in the face of estimation errors in the past. If firms adjust their estimates quickly and fully, then investment responds more fully to any unexpected changes in output. The third is the proportion of the capital stock that is replaced each year. The more stable this proportion, the less volatile is investment and, therefore, output. The fourth factor is the desired ratio of capital to expected output (v^*). The more the economy relies on capital-intensive production, the greater the responses to changes in expected output.

12. The discussion in the box on Tobin's q indicates that none of the models of investment do a particularly good job at either forecasting or explaining movements of construction spending by business.

   If economists are unable to either explain or forecast the movement of economic variables, then it is quite difficult to construct a policy rule that would stabilize the economy. For example, the constant growth rate rule discussed in previous chapters requires that policymakers know how fast natural real GDP grows and how velocity behaves over time in order to set the growth rate of the money supply that keeps inflation at its desired level. Even a Taylor Rule requires that policymakers know that real GDP responds to a change in the interest rate in a predictable fashion in order to use the rule as a method to stabilize the economy.

13. The decline in business confidence during the Great Depression caused a substantial decline in the desired capital stock relative to firms' actual capital stock. Therefore, investment expenditures dropped much more than real GDP, as shown in the graph on page 535, because first, net investment was negative, and second, firms did not need to replace capital goods as they wore out. Furthermore, the decline in real GDP also caused

consumption expenditures to fall, resulting in a further decline in the desired capital stock, which triggered additional cuts in investment expenditures.

The decline in real private domestic investment during World War II was because much of the new capital stock used to produce military goods and services during those years, while privately operated, was government owned and therefore not counted as part of real private domestic investment. On the other hand, during the war, the Federal government prevented businesses from producing capital goods that could be used to produce civilian goods and services.

14. A rise in interest rates would, other things equal, tend to reduce the quantity of investment demanded. In a period of high-level output, however, the accelerator effect leads to a surge in investment demand. Often during an economic boom, the latter effect will produce an increase in investment spending along with the higher interest rates. See Figure 16-5.

15. Tobin's q is the ratio of the market value of existing capital to its replacement cost, and investment is expected to decline as q falls. In the housing market, one could predict that if the prices of existing houses fall relative to the cost of constructing new houses, investment in new housing would decrease and that fewer new houses would be built.

16. The countercyclical changes in user cost under this investment tax credit plan would tend to make the economy more stable by reducing the fluctuations of investment spending over the business cycle. When the output ratio fell, the size of the tax credit would automatically rise, to lower user costs and stimulate investment spending, and when the output ratio rose the credit would automatically fall to raise user costs and rein in spending. However, the overall success of the plan would depend on whether the changes in user costs were of sufficient size to counteract the pro-cyclical changes in business confidence over the business cycle.

17. Liquidity constraints make investment more volatile because they impede the ability of firms to borrow based on their permanent income. Thus, fluctuations in output and firms' earnings lead to larger swings in investment spending than would otherwise occur. Larger firms with proven earnings records are less subject to liquidity constraints because lenders see them as less risky than smaller firms during periods of slow or no economic growth. When firms enjoy close formal relationships with banks and with other firms, as they do in Japan through *keiretsu* groups and in Germany with bankers sitting on corporate boards of directors, lenders are also likely to take a longer-run view of a firm's prospects, and hence its investment decisions are less likely to be constrained by liquidity considerations.

18. The volatility of investment weakens the argument that the private economy is inherently stable, particularly since the accelerator and neoclassical theories provide a theoretical explanation of that instability. That volatility strengthens the case for the Taylor Rule that calls for monetary policymakers to shift to either an easier or tighter policy, depending on either the current or forecasted state of the economy.