6. a. In steady state, $sf(k) = (n + d)k$

$0.1 \times 6k^5 = (0.01 + 0.14)k$
$0.6k^5 = 0.15k$
$0.6 / 0.15 = k / k^5$
$4 = k^5$
$k = 4^2 = 16$ = capital per worker
$y = 6k^5 = 6 \times 4 = 24$ = output per worker
$c = .9\ y = .9 \times 24 = 21.6$ = consumption per worker
$(n + d)k = .15 \times 16 = 2.4$ = investment per worker

b. To get $y = 2 \times 24 = 48$, since $y = 6k^5$, then $48 = 6k^5$, so $k^5 = 8$, so $k = 64$. The capital-labor ratio would need to increase from 16 to 64. To get $k = 64$, since $sf(k) = (n + d)k$, $s \times 48 = .15 \times 64$, so $s = .2$. Saving per worker would need to double.

7. First, derive saving per worker as $sy = y - c - g = [1 - .5(1 - t) - t]\ 8k^5 = .5(1 - t)8k^5 = 4\ (1 - t)k^5$

a. When $t = 0$, $sy = 4\ (1 - 0)k^5 = 4k^5$ = national saving per worker

Investment per worker = $(n + d)k = .1k$

In steady state, $sy = (n + d)k$, so $4k^5 = .1k$, or $40k^5 = k$, so $1600k = k^2$, so $k = 1600$. Since $k = 1600$, $y = 8 \times 1600^{.5} = 320$, $c = .5\ (1 - 0)\ 320 = 160$, and $(n + d)k = .1 \times 1600 = 160$ = investment per worker

b. When $t = 0.5$, $sy = 4\ (1 - 0.5)k^5 = 2k^5$ = national saving per worker

Investment per worker = $(n + d)k = .1k$

In steady state, $sy = (n + d)k$, so $2k^5 = .1k$, or $20k^5 = k$, so $400k = k^2$, so $k = 400$. Since $k = 400$, $y = 8 \times 400^{.5} = 160$, $c = .5\ (1 - 0.5)\ 160 = 40$, and $(n + d)k = .1 \times 400 = 40$ = investment per worker, $g = ty = .5 \times 160 = 80$.

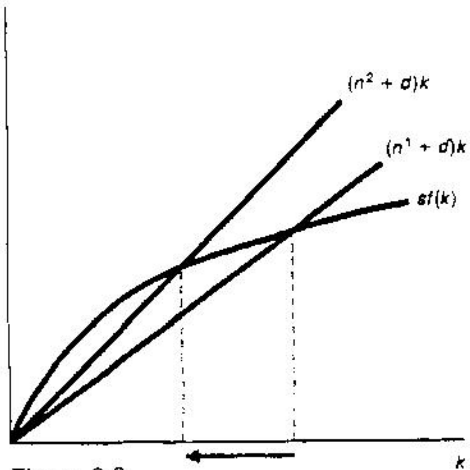

Figure 6.3

Analytical Problems

1. a. The destruction of some of a country's capital stock in a war would have no effect on the steady state, because there has been no change in *s, f, n,* or *d*. Instead, *k* is reduced temporarily, but equilibrium forces eventually drive *k* to the same steady-state value as before.

   b. Immigration raises *n* from n^1 to n^2 in Fig. 6.3. The rise in n lowers steady-state *k*, leading to a lower steady-state consumption per worker.

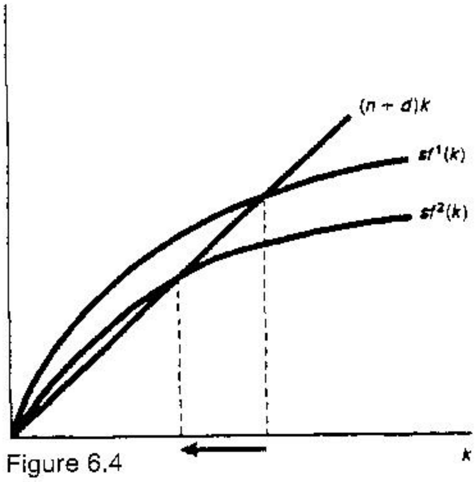

Figure 6.4

   c. The rise in energy prices reduces the productivity of capital per worker. This causes sf1 (k) to shift down from sf1(k) to sf2(k) in Fig. 6.4. The result is a decline in steady-state k. Steady-state consumption per worker falls for two reasons: (1) Each unit of capital has a lower productivity, and (2) steady-state k is reduced.

   d. A temporary rise in s has no effect on the steady-state equilibrium

   e. The increase in the size of the labour force does not affect the growth rate of the labour force, so there is no impact on the steady-state capital-labour ratio or on consumption *per worker,* however, because a larger fraction of the population is working, consumption per person increases.

2. The rise in capital depreciation shifts up the (n + d)k line from (n + d1)k to (n +d2)k, as shown in Fig. 6.5. The equilibrium steady-state capital-labour ratio declines. With a lower capital-labour ratio, output per worker is lower, so consumption per worker is lower (using the assumption that the capital-labour ratio is not so high that an increase in k will reduce consumption per worker). There is no effect on the long-run growth rate of the total capital stock, because in the long run the capital stock must grow at the same rate (n) as the labour force grows, so that the capital-labour ratio is constant.

c. This can be solved either by setting money supply equal to money demand, or by setting bond supply equal to bond demand.

Md = Ms
\$50,000 – \$500,000 (i – im) = \$20,000
\$30,000 = \$500,000i [Setting im = 0]
i = 0.06 = 6%
Bd = Bs
\$50,000 + \$500,000i = \$80,000
\$500,000i = \$30,000
i = 0.6 = 6%

3. a. From the equation MV = PY, we get M / P = Y / V. At equilibrium, M^d = M. so M^d / P = Y, V = 10,000 / 5 = 2000. M^d = P × (M^d / P) = 2 × 2000 = 4000.

b. From the equation MV = PY, P = MV / Y.
When M = 5000, P = (5000 × 5) / 10,000 = 2.5.
When M = 6000, P = (6000 x 5) / 10,000 = 3.

4. a. $\pi = \eta_Y \Delta Y/Y = -0.5$ x: 6% = –3%. The price level will be 3% lower.

b. $\pi = \eta_R \Delta r/r = -(-0.1) \times 0.1 = 1\%$. The price level will be 1% higher.

c. With changes in both income and the real interest rate, to get an unchanged price level would require
$\eta_Y \Delta Y/Y + \eta_R \Delta r/r = 0$, so [0.5 x (Y -100/100] – [0.1 x 0.1] = 0, so Y = 102

5. a. $\pi^e = \Delta M/M = 10\%$, $I = r + \pi^e = 15\%$. M/P = L = 0.01 x 150/0.15 = 10. P = 300/10 = 30

b. $\pi^e = \Delta M/M = 5\%$, $I = r + \pi^e = 10\%$. M/P = L = 0.01 x 150/0.10 = 15. P = 300/15 = 20

The slowdown in money growth reduces expected inflation, increasing real money demand, thus lowering the price level.

6. a. With a constant real interest rate and zero expected inflation, inflation is given by the equation. $\pi = \Delta M/M - \eta_Y \Delta Y/Y$. To get inflation equal to zero, the central bankshould set money growth so that $\Delta M/M = \eta_Y \Delta Y/Y$ = 2/3 x .045 = .03 = 3%. Note that theinterest elasticity isn't relevant, since interest rates don't change.

b. Since $V = PY/M$, $\Delta V/V = \Delta P/P + \Delta Y/Y - \Delta M/M$

= 0 + .045 - .03
= .015
So velocity should rise 1.5% over the next year.

Analytical Problems

1. a. People would probably take money out of chequing accounts and put it into money market mutual funds and money market deposit accounts. Money market mutual funds and money market deposit accounts are included in M2 but are not part of M1. The result is a decrease in M1, but no change in M2. M2 does not increase because M1 is part of M2, so the decrease in M1 offsets the increase in the rest of M2.