Answers to the Midterm

Part A:

LF Stats Answer

a) Of the 28.5 million available to work, 3.5 million are not working or looking to work, so it must be that there are 25 million in the labour force: $LF = WAP - N = 28.5 - 3.5 = 25$ million.

b) The employment rate is the ratio of employed to the working age population: $ER = \frac{E}{WAP} = .70175 = \frac{E}{28.5}$. So $E = 20$ million.

c) The participation rate is the ratio of the working age population participating in the labour force: $PR = \frac{LF}{WAP} = \frac{25}{28.5} = 87.7\%$.

Incidently, $U = 5$ million, so the unemployment rate $= \frac{U}{LF} = \frac{5}{25} = 20\%$.

RE Answer

a) RE states that for a given path of gov't spending, the timing of taxes does not matter – temporary tax cuts (which require larger tax increases in the future) do not affect national consumption, savings or output.

This would hold if HHs understood that a cut in taxes today, for a given level of gov't spending, will require raising taxes in the future. If so, despite their higher after-tax disposable income today, they would not change their desired consumption and would simply save the tax cut, earn 1+r and give it back to the gov't next period. If HHs spent some of the tax cut, national consumption rises, national savings fall (so would interest rates in the S-I diagram). Since Y=C+I+G, C goes up, G is unchanged, **but also note at the higher interest rate there would be a crowding out effect on investment. On net, output Y would rise.

b) You would prefer that RE didn't hold, and HHs would at least partially spend the money and stimulate the economy.

c) Possible reasons for the failure of RE include: borrowing constraints; short-sightedness; uncertainty about the future tax burden implied by today's tax and spending; (and non lump-sum taxes).

Growth and Interest Rates

a) Elasticity of output with respect to capital, or factor share of capital in total product/output.

b) $\frac{\triangle A}{A} = \frac{\triangle Y}{Y} - a_K \frac{\triangle K}{K} - a_N \frac{\triangle N}{N}$
$\frac{\triangle A}{A} = 150\% - (.4)140\% - (.6)50\%$

$\frac{\triangle A}{A} = 64\%$

c) Expected real interest = 1% If inflation turns out to be 5%, the borrower benefits, the real interest rate turns out to be -1

Shocks to Stocks

a) Productivity A will fall and this will lower $\bar{Y}$. The lower MPN will reduce labour demand and full-employment employment. N^s is not affected. The real wage would drop.

b) If the impact was permanent, people would respond by supplying more labour and the N^s curve would shift to the right, increasing full-employment employment and pushing down the real wage.

Part B:

Market for Capital

a)

$$MP_K = \frac{\partial Y}{\partial K} = \frac{A}{2} K^{\frac{-1}{2}} N^{\frac{1}{2}} = \frac{A}{2} (\frac{N}{K})^{\frac{1}{2}}$$

Optimality requires $MP_K = r$. So $\frac{A}{2}(\frac{N}{K^D})^{\frac{1}{2}} = r$.

Which implies: $K^D = \frac{A^2}{4}\frac{N}{r^2}$.

b) $\frac{\partial K^D}{\partial r} = -\frac{2A^2 \cdot N}{4r^3} < 0$.

c)

$$K^D = I^D = \frac{2^2}{4} \cdot \frac{16}{r^2} = S^D = 2,000,000r$$

$$r^3 = .0000008$$

$$r^* = .02$$

d) At real interest rate $r^* = .02, S^D = 2,000,000 \cdot r^* = 40,000$. You can verify $K^D = I^D = 40,000$ as well, so this is an equilibrium.

e) From equation (4.3), $uc = (r + d) \cdot P_K = (.02 + .10) \cdot \$48 = \$5.76$. Setting

$$uc = \$5.76 = MP_K = \frac{A}{2} (\frac{N}{K})^{\frac{1}{2}}$$

$$K^{\frac{1}{2}} = \frac{\sqrt{16}}{5.76}$$

$$K^* = \frac{16}{33.2} = 0.482$$

To Consume, or Not to Consume

a) Recall from AS 2, we eventually get the general formula:

$$c^* \cdot (\frac{2+r}{1+r}) = after - taxPVLR$$

In this case,

$$after - taxPVLR = (\$60k - \$20k) + \frac{(\$30k - \$5k)}{1.15} = \$61,739.13.$$

$\Rightarrow c^* = c^{f*} = \$33,023.26$, $s^* = y - t - c^* = \$6,976.74$.

b) The key is to notice that the tax burden over Ron's lifetime is unchanged, only the timing of tax collections are different. i.e. $\Delta after - taxPVLR = 0$. Thus there is no change in Ron's optimal consumption $c^* = c^{f*} = \$33,023.26$. Like a good consumption-smoother, he simply saves the $\$20,000$ tax cut, so $s^{*'} = \$26,976.74$. That's Ricardian Equivalence again! It applies here because Ron is: forward-looking; understands what today's tax changes imply for tomorrows taxes; and is not borrowing constrained. Going through the math demonstrates this result.

c) Now there is a decrease in Ron's

$$after - taxPVLR = (\$60k - \$20k) + \frac{(\$30k - \$5k)}{1.25} = \$60,000.$$

$$c^* \cdot (\frac{2+r}{1+r}) = after - taxPVLR$$

Relative to (a), consumption rises, savings fall: $\Rightarrow c^{*'} = \$33,333.33$, $s^{*'} = \$6,666.67$.

d) The substitution effect leads to more savings as the return to savings rises. *For a saver*, the income effect would lower savings, since the same amount can be got with less savings, due to the higher return. In our example, since Ron is a saver, the higher interest rate makes him better off. In this question, the income effect dominates and savings fall.

Current Accounts

a) $S_A^d = I^d + NX = I^d + Y(C^d + I^d + G) = Y - C^d - G$
$S_A^d = 10 + 500r^w$

$CA_A + CA_B = 0$
$(S_A^d - I_A^d) + (S_B^d - I_B^d) =$
$(10 + 500r^w - 40 + 1000r^w) + (20 + 2500r^w - 110 + 4000r^w)$
$-120 = -8000r^w$
$r^w = 0.015 = 1.5\%$

$CA_A = (S_A^d - I_A^d) = -7.5$
$CA_B = (S_B^d - I_B^d) = 7.5$

b) $S_{pvt} = 500 - 150 - 300 + 500 \times .015 + 10 + 110 = 177.5$
$S_{gvt} = 150 - 10 - 110 - 190 = -160$

c) Increase G by 60:
$S_A^d = I^d + NX = I^d + Y(C^d + I^d + G) = Y - C^d - G$
$S_A^d = -50 + 500r^w$

$CA_A + CA_B = 0$
$(S_A^d - I_A^d) + (S_B^d - I_B^d) =$
$(50 + 500r^w - 40 + 1000r^w) + (20 + 2500r^w - 110 + 4000r^w)$
$-180 = -8000r^w$
$r^w = 0.0225 = 2.25\%$

$CA_A = (-50 + 500 \times .0225 - 40 + 1000 \times .0225) = -56.25$
$CA_B = (20 + 2500 \times .0225 - 110 + 4000 \times .0225) = 56.25$

d) The Shelbyville current account would be debited because the Shelbyville is importing a service. The Springfield current account would be credited. An offsetting transaction, Springfield could purchase a bond from the Shelbyville which would be a debit in the Springfield capital account and a credit in the Shelbyville capital account.

The Simpsons' GDP

Income Approach:
Bart Profit = \$42 - \$5 - \$10 - \$2 = \$25
Burns Profit = \$30 - \$10 - \$5 - \$20= -\$5

	Bart	Monty	Total
Wage	5	10	15
Taxes	10	5	15
Interest	2		2
Profit	25	-5	20

GDP = 52

Production approach:
Two different ways:
i) Final product of Bart = 22 (the $20 sold to Monty is an intermediate good); final product of Monty = 30
ii) Bart's value added = value of production - value of inputs = $20 + 10 + 12 - 0 = 42$
Monty's value added = $30 - 20 = 10$

GDP = 52

Expenditure approach:
Industrial Waste: Bart's sales to public = 10
Bart's Inventory Investment (counted like he purchased it) = 12
Nuclear Power: Monty's sales = 30
GDP = 52

b) The $12 of inventory investment would now be part of revenue and would be considered exports.

c) Homer would work less due to the income effect, there is no substitution effect.