Macroeconomic Theory
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Suggested Answers to Spring 2008 Midterm Examination #2

1. This question employs the following variant of Model 4

Consumption:	$C = a + b*Yd - c*r$
Investment:	$I = e-d*r$
Disposable Income:	$Yd = (1-t)*Y$
Aggregate Demand:	$AD = C + I + G$
Goods Market Equilibrium:	$Y = AD$
Money Demand:	$Md/P = kY - h*r + Mo$
Money Market Equilibrium:	$M = Md$
Labor Supply:	$Ls= n0 + n1*(W/P) +n2*(P/Pe)$
Labor Demand:	$W/P = d0 - d1*Ld + d2*K$
Unemployment Rate:	$U = (Ls-Ld)Ls \quad +U*$
Production Function:	$Y = s1*Ld + s2*K$

a. First find the IS and LM curves.

The IS curve comes from the first 4 equations.

$$AD = a + b*(1-t)*Y - c*r + e-d*r + G = a + b*(1-t)*Y - (c+d)*r + e + G$$

The LM curve is given by equating money demand and money supply.

$M/P = k*Y - h*r +Mo$ so $r = (k/h)*Y - (1/h)*(M/P) + (1/h)*Mo$

Now, plug this result into the IS equation and replace Y with AD.

$$AD = a + b*(1-t)*Y - (c+d)*[(k/h)*Y - (1/h)*(M/P) + (1/h)*Mo)] + e + G$$

$$AD*(1-b*(1-t)+(c+d)*(k/h)) = a + ((c+d)/h)*(M/P) - ((c+d)/h)*Mo +e + G$$

so $AD = \dfrac{a + ((c+d)/h)*(M/P) - ((c+d)/h)*Mo +e + G}{1-b*(1-t)+(c+d)*(k/h)}$

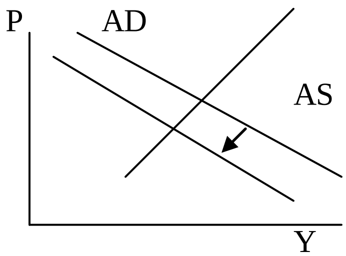
As P increases, M/P declines. The coefficient is positive so AD also falls; thus, the result is a negative slope

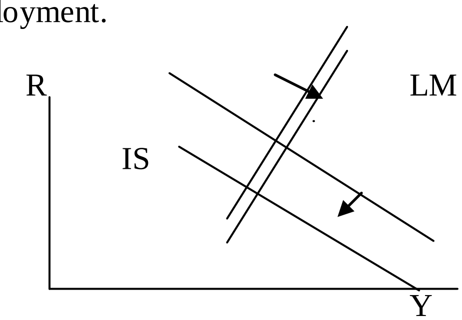
b. The AS curve comes from plugging Ld into the production function. First, solve for Ld.

$Ld = \dfrac{d0 + d2*K - W/P}{d1}$ and $Y = s1*d0/d1 + (s1*(d2/d1) + s2)*K -(s1/d1)*W/P$

as P increases, W/P falls so Y rises – a positive slope.

c. A decrease in the exogenous portion of investment demand can be represented by a decline in e. This exogenous factor enters both the IS and AD curves; thus, both shift in. Given that the AS curve has a positive slope and the AD curve a negative slope, the effect in the goods market would be a decline in both prices (P) and output (Y). The inward shift in the IS curve as well as the reduced P, which shifts the LM curve to the right, yield a reduced real interest rate. Since P falls, W/P rises. In the labor demand equation, a rise in W/P yields a fall in employment.





d. An increase in expected prices only affects the labor supply curve and, consequently, the unemployment rate. As Pe increases, P/Pe falls so labor supply falls (shifts back towards the W/P axis.) Ls enters both the numerator and the denominator of the unemployment rate function. Since the numerator is much smaller than the denominator and since the magnitude of the change in both is the same, the numerator will fall by a greater percentage than the denominator; so the unemployment rate would fall. Graphically the gap between Ld and Ls would narrow; so the number of unemployed would also fall.

2.a. Divide both sides of the production function by L to yield
$Y/L = (K)^{1/3} L^{-1/3}$ which can be rewritten as $\mathbf{y = k^{1/3}}$ **(A) – long run supply.**
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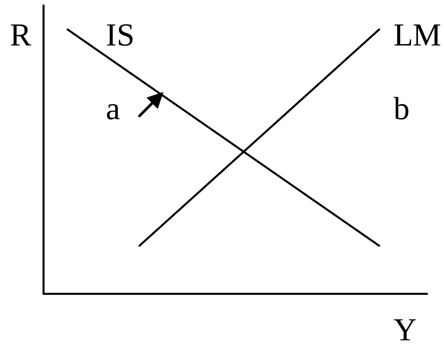
b. We know from the model (equation 6) that capital growth must equal labor growth along the long run path.. But we are given from the question that K grows at 2%, call it g; therefore, labor must also grow at g. Since capital growth is given by $s^*(y/k) - \delta = g$, we can solve for y to yield $\mathbf{y = (g+ \delta)^*k/s}$ **(B) long run demand**
Now, we put our two equations (A and B) together to yield $\mathbf{y = (s/(g+ \delta))^{.5}}$ **(C)**
In this case, that equals $(.1/(.02+.1))^{.5} = .913$

c. Since $y = (s/(g+ \delta))^{.5}$ and $k = y^3$, $k = (s/(g+ \delta))^{1.5}$
so the capital/ output ratio = $(s/(g+\delta))$ – is not a function of time

d. From the production function, we find that output per laborer will grow at the following (1/3)*Kgr + (2/3)*Lgr - Lgr = (1/3)*(.02) + (2/3)*(.02) - .02 = 0%. Output, however, will grow at 2.0%, the same rate as capital and labor.

e. Changes in the depreciation rate affect the denominator in C. If δ doubles, y must fall. Since output = y*L and L is not a function of δ, it would fall by a similar percentage.

3. First draw an IS – LM graph. Then plot relevant points for a and b.



c. A liquidity trap refers to situations in which all additions to the stock of money are held by households or banks and not lent out. It is represented by both a flat money demand curve and a flat LM curve. For monetary policy to be particularly potent, the LM must not be flat, and the IS curve should be reasonably flat. The latter means that investment demand (d) and net export demand (n) are very sensitive to changes in the interest rate. If either the LM curve is flat or the IS curve is very steep (insensitive investment and net export demand), monetary policy will have little effect on output.

4. As described in class, funding G by tax increases yields both an outward and an inward shift in the IS curve with the net result, a small outward shift in the IS so both interest rates and income would rise by a small amount as indicated in Figure A.

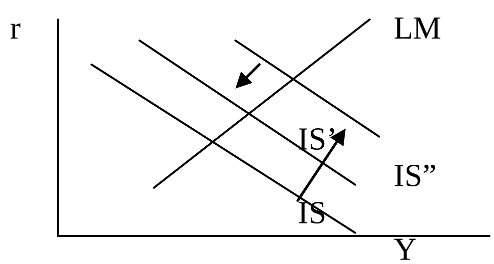


Figure A

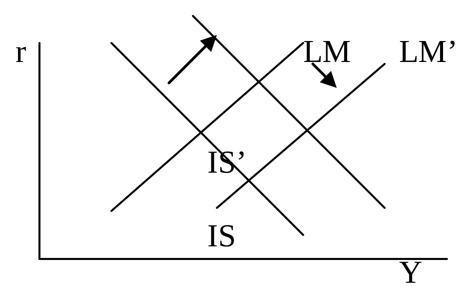


Figure B

Funding by bonds would yield only the first shift in the IS curve; thus, both interest rates and output would rise more than in the tax-funded case.

Funding by money creation would shift both the IS and the LM curves to the right and yield a large increase in output and little change in interest rates. (See Figure B.)

Thus, both the magnitude of output and real interest rates are influenced by how G is funded, not just whether a deficit exists or not.

5. First, write down the version of Model 2 indicated in the question.

$C = a + b^* Yd$	(1)
$Yd = Y – T$	(2)
$T = to + t1^*Y$	(3)
$NX = eX – imo – im1^*Yd$	(4)
$AD = C + I + G + NX$	(5)
$Y = AD$	(6)

Endogenous Variables	Exogenous Variables
C, Yd, T, NX, AD, Y	a, to, t1, eX, imo, I, G

a. To determine the equilibrium value for Y, we first need to plug the various pieces into the components of AD and then into the AD equation.

Start by plugging (3) into (2) and then (2) into both (1) and (4)

$Yd = Y – to – t1^*Y = Y^*(1-t1) – to$ and then

(2) becomes **$C = a + b^* [Y^*(1-t1) – to]$ (2')** and
(4) becomes **$NX = eX – imo – im1^*[Y^*(1-t1) – to]$** (4')

Now, plug these results into (5) and set equal to (6)

$Y = a + b^* [Y^*(1-t1) – to] + I + G + eX – imo – im1^*[Y^*(1-t1) – to]$

Now, collect all of the Y terms and move them to the left hand side to yield

$Y - b^* Y^*(1-t1) + im1^*Y^*(1-t1) = a – b^*to + I + G + eX – imo + im1^*to$

The equilibrium value for Y then can be found by factoring out Y on the left hand side and dividing both the sides by the other factor.

$$Y = \frac{a – b^*to + I + G + eX – imo + im1^*to}{1 – b^*(1-t1) + im1^*(1-t1)}$$

b. To determine the effect of equal changes in G and to on Y, we need to add together two multipliers

$\Delta Y/\Delta G + \Delta Y/\Delta to = (1 – b)/ [1 – b^*(1-t1) + im1^*(1-t1)]$ which is positive but < 1

To determine the effect of these changes on consumption, we need to use 2'and the information we just generated since the equilibrium value of consumption depends upon the equilibrium value of Y. From (2'), we find
$\Delta C/\Delta G + \Delta C /\Delta to = b^*(1-to)^*[\Delta Y/\Delta G + \Delta Y/\Delta to] – b^*\Delta to$ which with a bit of algebra can also be shown to be positive.