

Intermediate Macroeconomics C11-1
Professor Gordon
Final Examination, Spring 1999

YOUR NAME: _____

SOCIAL SECURITY NUMBER: _____

- INSTRUCTIONS:
1. This is a closed book exam. You may use a calculator
 2. Write your answers to Part A in the blanks on this page. **Do not write your answers on the multiple choice questions.**
 3. Write your answers to Part B and Part C in the spaces provided.

	TIME ALLOCATION	POINT ALLOCATION
PART A	40	40
PART B	60	60
PART C	30	30

PART A – In the spaces below write your answers to the multiple choice questions (40 minutes, 1 point each.)

- | | | | |
|-----------|-----------|-----------|-----------|
| 1. _____ | 11. _____ | 21. _____ | 31. _____ |
| 2. _____ | 12. _____ | 22. _____ | 32. _____ |
| 3. _____ | 13. _____ | 23. _____ | 33. _____ |
| 4. _____ | 14. _____ | 24. _____ | 34. _____ |
| 5. _____ | 15. _____ | 25. _____ | 35. _____ |
| 6. _____ | 16. _____ | 26. _____ | 36. _____ |
| 7. _____ | 17. _____ | 27. _____ | 37. _____ |
| 8. _____ | 18. _____ | 28. _____ | 38. _____ |
| 9. _____ | 19. _____ | 29. _____ | 39. _____ |
| 10. _____ | 20. _____ | 30. _____ | 40. _____ |

PART B

QUESTION 1 (21 points; 21 minutes)

This question studies the qualitative effects of different government policies under three different setups.

Consider the three following cases related to the assumptions on the goods and money markets, which imply distinct aggregate demand curves.

CASE 1: (7 points) Neither investment nor consumption respond to the interest rate. There is a Pigou effect. The money demand is standard.

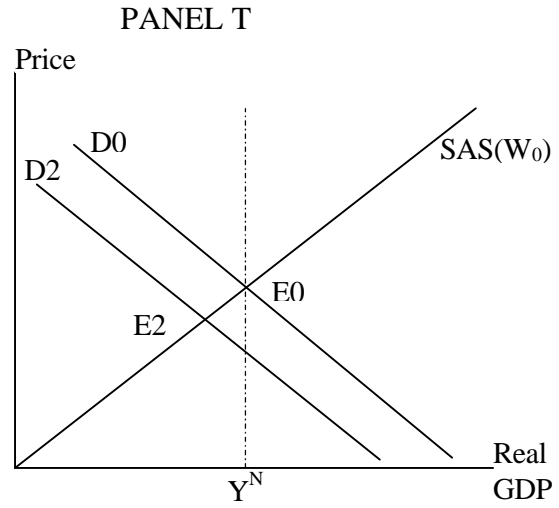
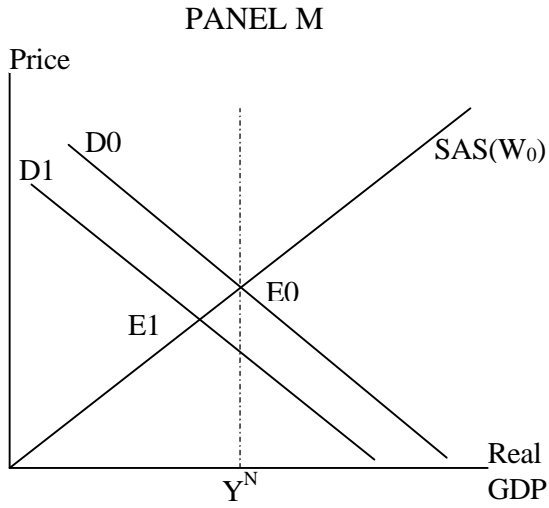
CASE 2: (7 points) Investment and consumption respond negatively to the interest rate. Money demand responds negatively to the interest rate but it doesn't respond to output. There is no Pigou effect.

CASE 3: (7 points) Investment and consumption respond negatively to the interest rate. Money demand is infinitely elastic (horizontal) to changes in the interest rate. There is no Pigou effect.

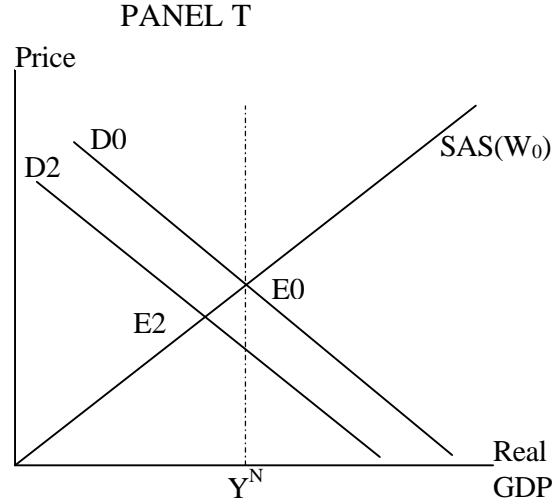
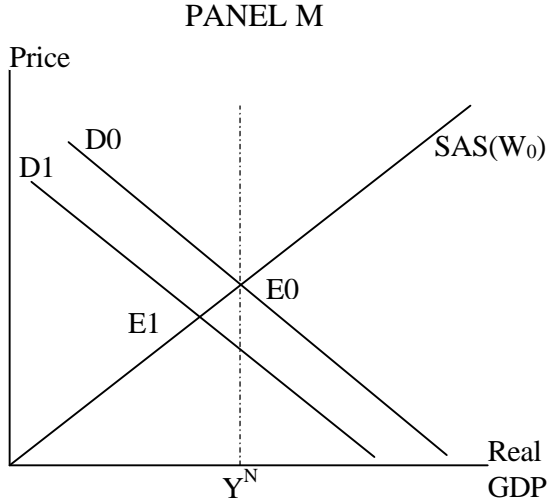
For each of the 3 cases described above, use the empty panels below to:

- (a) draw the corresponding aggregate demand curve (D_0) and the resulting short run equilibrium (E_0) in both panels (M) and (T)
- (b) consider a decrease in the money supply. Draw in panel (M) the new aggregate demand curve (D_1) and the new short run equilibrium (E_1).
- (c) consider an increase in the autonomous taxes. Draw in panel (T) the new aggregate demand curve (D_2) and the new equilibrium (E_2).

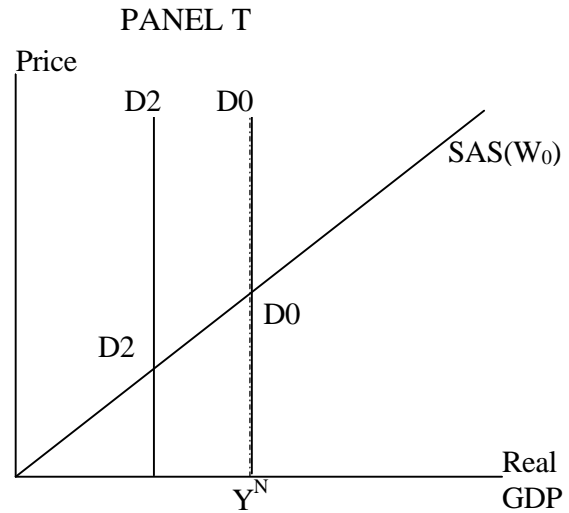
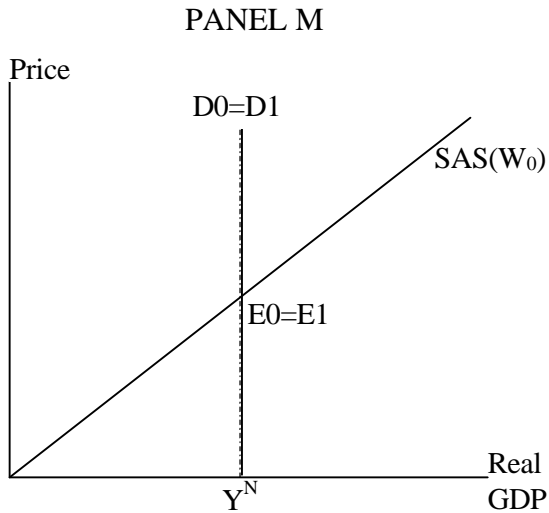
CASE 1:



CASE 2:



CASE 3:



QUESTION 2 (17 points; 17 minutes)

Consider the following model of production. Firms are perfectly competitive and there is no autonomous growth ($A=1$ and constant). These assumptions are maintained throughout the problem.

Output (Y) is produced according to a Cobb-Douglas production function. The factors of production are physical capital (K) and labor (N). The elasticity of output with respect to labor is given by $\alpha=0.7$.

- (i) (2 points) Write down an expression for per capita output in this economy.

$$Y/N=(K/N)^{1-0.7}$$

- (ii) (4 points) Consider two different economies, in which per capita output is produced according to the production function derived in (i). In the first, say the US, output per capita is equal to 2. In the second, say Taiwan, output per capita is equal to 1.

What is the level of capital per worker (K/N) in each of the two economies?

$$\text{US} \quad 2=(K/N)^{0.3} \quad \rightarrow \quad (K/N)_{\text{US}}=10.07$$

$$\text{Taiwan} \quad 1=(K/N)^{0.3} \quad \rightarrow \quad (K/N)_{\text{Taiw}}=1$$

Now consider the following alternative production function. The factors of production are physical capital (K), human capital (H) and labor (N). The production function is Cobb-Douglas. The elasticity of output with respect to labor is $\gamma=0.40$, the elasticity of output with respect to human capital is $\beta=0.40$. The elasticity of output with respect to physical capital is equal to $1-\beta-\gamma$.

The aggregate production function is $Y=AN^\gamma H^\beta K^{1-\beta-\gamma}$

- (iii) (2 points) Write down an expression for the production function of per capita output in terms of per capita physical capital (K/N) and per capita human capital (H/N).

$$Y=(K/N)^{0.2}(H/N)^{0.4}$$

- (iv) (5 points) Now consider the two economies described in (ii) (the US and Taiwan). The level of human capital per worker (H/N) is equal to 1 in the first economy (the US) and it is equal to 0.2 in the second economy (Taiwan).

What is the level of capital per worker (K/N) in each of the two economies?

$$\text{US} \quad 2=(K/N)^{0.2}(1)^{0.4} \quad \rightarrow \quad (K/N)_{\text{US}}=32$$

$$\text{Taiwan} \quad 1=(K/N)^{0.2}(0.2)^{0.4} \quad \rightarrow \quad (K/N)_{\text{Taiw}}=25$$

- (v) (4 points) Based on your answers to questions (ii)-(iv), explain *in no more than thirty words* how introducing human capital in the Solow growth model can improve it's ability to explain cross-country differences in the standard of living.

The Solow growth model can account for observed differences in the standard of living (i.e. output per capita) only by relying on implausibly large differences in output per capita (see answer to (ii)). Introducing human capital corrects this deficiency of the model, by allowing differences in output per capital across countries to be explained by other factors, like education.

QUESTION 3 (22 points; 22 minutes)

Consider an economy with the following SP relationship

$$p = p^e + 0.25 \hat{Y} + z$$

where p and p^e are actual and expected rates of inflation, \hat{Y} is the log output ratio (where $\hat{Y} = 100 \cdot \ln[Y/Y^N]$ where Y^N is the natural rate of real output) and z is a supply shock. Assume that the growth rate of natural GDP is zero, so that nominal GDP growth is the same as *excess* nominal GDP growth. Also assume that inflationary expectations p^e are given by

$$p^e = p_{-1}$$

a) (1 point) Write the equation for the DG curve (ie. p in terms of x , \hat{Y} , and \hat{Y}_{-1} .)

$$p = x - \hat{Y} + \hat{Y}_{-1}$$

b) (4 points) Suppose that in all years leading up to and including 1999 the economy has received a steady stream favorable supply shocks (most recently from innovations in computer technology) so that $z = -1$. Also during this time the government has maintained a constant rate nominal GDP growth of 3% (ie. $x = 3$ in all years up to and including 1999.) Suppose that in 1999 the economy is at its long run equilibrium level (characterized by $\hat{Y} = \hat{Y}_{-1}$ and $p = p_{-1}$.) Find the 1999 levels of \hat{Y} , p and p^e

$$\text{SP: } p = p_{-1} + 0.25 \hat{Y}_{-1} - 1, p = p_{-1} \Rightarrow 0 = 0.25 \hat{Y}_{-1} - 1 \Rightarrow \hat{Y} = 4$$

$$\text{DG: } p = 3 - \hat{Y} + \hat{Y}_{-1}, \hat{Y} = \hat{Y}_{-1} \Rightarrow p = 3$$

$$\text{and } p^e = p_{-1} = p = 3$$

c) (5 points) Now suppose that in the year 2000 the stream of favorable supply shocks abruptly end and now $z = 0$. The government is facing an election at the end of the year, so to prevent a loss of votes from a fall in the employment and output level, it decides to accommodate the supply shock. Find the year 2000 level of x required to accommodate the shock and the resulting levels of \hat{Y} and p .

$$\text{Accommodation requires } \hat{Y} = \hat{Y}_{-1}$$

$$\text{DG: } p = x - \hat{Y} + \hat{Y}_{-1} \Rightarrow p = x \text{ (since } \hat{Y} \text{'s cancel)}$$

$$\text{SP: } p = 3 + 0.25 \hat{Y} \Rightarrow p = 3 + 0.25(4) = 4 \text{ (since } \hat{Y} = \hat{Y}_{-1} = 4)$$

$$\text{therefore, } p = x = \hat{Y} = 4$$

d) (4 points) Due to a Y2K computer glitch in the government policy model, the government implements $x=5$ instead of the value calculated in (c). Calculate the year 2000 levels of \hat{Y} and p in this case

$$\text{SP: } p=3+0.25\hat{Y}$$

$$\text{DG: } p=5-\hat{Y}+4$$

$$\text{set DG=SP: } 3+0.25\hat{Y}=5-\hat{Y}+4 \Rightarrow \hat{Y}=6/1.25=4.8, p=5-4.8+4=4.2$$

e) (4 points) The government wins the election in a landslide and commits to a constant level of nominal GDP growth of $x=5$ for 2001. There is no change in the supply shock variable between the years 2000 and 2001. What are the 2001 levels of \hat{Y} and p ?

$$\text{SP: } p=4.2+0.25\hat{Y}$$

$$\text{DG: } p=5-\hat{Y}+4.8$$

$$\text{set DG=SP: } 4.2+0.25\hat{Y}=5-\hat{Y}+4.8 \Rightarrow \hat{Y}=5.6/1.25=4.48, p=5-4.48+4.8=5.32$$

f) (4 points) Suppose that from 2001 onwards all future policy makers maintain $x=5$ and there are no further supply shocks (so $z=0$.) The economy will eventually return to long run equilibrium. Calculate the long run equilibrium levels of \hat{Y} and p . Compare with part (b): which factor causes p to differ? which factor causes \hat{Y} to differ?

$$\text{DG} \Rightarrow p=x=5 \text{ (since } \hat{Y}=\hat{Y}_{-1}\text{)}$$

$$\text{SP} \Rightarrow \hat{Y}=0 \text{ (since } p=p_{-1} \text{ and } z=0\text{)}$$

\hat{Y} is lower than (b) in because z is higher, p is higher than in (b) because x is higher.