# Econ 1: Spring 2012: Sample Final Exam Problem Answers

## II. Making Macroeconomic Policy

Suppose that it is December 2012 and you are called to Washington to audition for a cabinet-level post in the next administration and to advise him on the proper size of the economic stimulus program.

Your forecast is that, were 2014 to be a normal business-cycle time, that the level of GDP in 2014 would be $17.0 trillion/year. You are conducting your analysis in the income-expenditure framework where: $Y = C + I + G$, $C = c_o + c_y Y$. You believe that $c_y = 0.5$.

You project that there will be little change from trend in consumer confidence $c_o$, which you project at $3 trillion/year in 2014. you project that business demand for investment spending will be $4 trillion/year in 2014. And you project that the Federal Reserve will not take additional steps to stimulate the economy.

a. What level of government purchases spending G do you recommend for 2014? Why?

**The equation for potential output is:**

**$Y^* = \$17.0T$**

**Use the income expenditure model to calculate what value of G gets the economy to potential output:**

**$Y = C + I + G$, $C = c_o + c_y Y$**
**$Y = \$3T + (0.5)Y + \$4T + G$**
**$Y-(0.5)Y = \$3T + \$4T + G$**
**$Y = \$6T + \$8T + 2 \times G$**
**$Y = \$14T + 2 \times G$**
**$\$17T = \$14T + 2 \times G$**
**$\$3T = 2 \times G$**
**$G = \$1.5T$**

**Then you can argue over whether the government ought to try to do more or less than what is expected to push the economy to full employment. It's important to explain why potential output is a good goal--or why your preferred alternative is a better goal.**

b. Suppose that the President-Elect's political advisors say that it is very important, politically, to cut government spending. What do you say in response?

**Here are three possibilities:**

**(i) Shrug your shoulders, and say that you are giving economic advice...**
**(ii) In the long run a healthy and strong economy is the most important thing to aim for even from a political point of view...**
**(iii) It is also very important, politically, to show that the President knows what he is doing and that means reducing unemployment--which means not cutting spending but boosting it...**

**Any can be defended.**

c. Suppose that the collapse of the euro suddenly drives up interest rate spreads, and leads you to forecast that I in 2014 will be not $4 trillion but $3.5 trillion. How do you change your recommendation for G?

**Redo your income-expenditure calculation:**

**Y-(0.5)Y = $3T + $3.5T + G**
**Y = $6T + $7T + 2 x G**
**$17T = 13T + 2 x G**
**G =$2T**

**Boost G from $1.5T to $2T**

## III.Problems

**A. Phillips Curve:** Consider the Phillips Curve framework in which $\pi = E(\pi) + \beta(u^* - u)$—the inflation rate $\pi$ equals: (i) the previously-expected inflation rate $E(\pi)$, (ii) plus the "slope" coefficient $\beta$, (iii) times the difference between the natural rate of unemployment $u^*$ and the actual rate of unemployment $u$.

Calculate the rate of inflation $\pi$ if:

a. $E(\pi) = 2\%$ per year, $\beta = ½$, $u^* = 6\%$, $u = 4\%$

**3%**

b. $E(\pi) = 9\%$ per year, $\beta = ½$, $u^* = 5\%$, $u = 7\%$

**8%**

c. $E(\pi) = 2\%$ per year, $\beta = ½$, $u^* = 4\%$, $u = 8\%$

**0%**

d. $E(\pi) = 4\%$ per year, $\beta = ½$, $u^* = 5\%$, $u = 10\%$

**1.5%**

e. $E(\pi) = 6\%$ per year, $\beta = ½$, $u^* = 5\%$, $u = 8\%$

**4.5%**

f. $E(\pi) = 0\%$ per year, $\beta = ½$, $u^* = 6\%$, $u = 4\%$

**1%**

**B. Supply and Demand:** In the central part of the state of Euphoria there is a small city, Avicenna, which is the home of Euphoric State University. ["Avicenna" is a corruption of the Arabic Ibn Sina, the byname of the great eleventh--−century Iranian Abu Ali al--−Husayn ibn Abd Allah ibn Sina: academic administrator, Quran reciter, astronomer, chemist, geologist, psychologist, theologian, mathematician, physicist, physician, poet, and paleontologist.] Consider the daily market for espresso−based drinks in Avicenna with demand and supply curves given by the equations:

$$QD = 5000 - 1000P$$
$$QS = -10000 + 4000P$$

where $P$ is the price of an espresso−based drink in dollars. Now suppose that PDC becomes alarmed at the number of strokes that are being treated at the public hospitals of Euphoria, and becomes aware of the link between caffeine consumption and blood pressure on the one hand and between blood pressure and strokes on the other. They decide to impose on consumers a $1/drink tax on espresso drinks and devote the money to hospital stroke−care units.

a. What is the equilibrium price that consumers pay?

**P in general will be the price that consumers pay. P-1 will then be the price that producers receive.**

**5000 - 1000P = -10000 + 4000(P-1)**

**5000 - 1000P = -10000 + 4000P - 4000**

**19000 = 5000P**

**P = 19000/5000 = $3.80 is the equilibrium price paid by consumers**

b. What is the equilibrium price that producers receive?

**P -1 = $2.80 is the equilibrium quantity received by producers**

c. What is the equilibrium quantity?

**Q = 5000 - 1000P = 5000 - 1000(3.80) = 5000 - 3800 = 1200**

d. How much money is raised for hospital stroke care units?

**Government revenue = 1200 x 1 = $1200**

e. What is the producer surplus?

***QS* = −10000 + 4000(P-1)**

**Q = 1200**

**When P-1 = $2.50 --> QS=0**

**But P-1 = $2.80 --> QS = 1200**

**Average cost to producers = $2.65**

**Revenue per unit to producers = $2.80**

**$0.15 x 1200 = $180 is the producer surplus**

f. What is the consumer surplus?

***QD* = 5000 − 1000P**

**If P = 5 --> QD = 0**

**P = $3.80 --> QD = 1200**

**Average valuation of a consumer $4.40**

**Cost to a consumer is $3.80**

**$0.60 x 1200 = $720 is the consumer surplus**

**C. Monopoly:** In the far north of the state of Euphoria there is a small town called Ihavefoundit. There is one theater in Ihavefoundit, and there is no connectivity to the outside world whatsoever. This means that the 1000 or so residents of Ihavefoundit who have a fondness for watching classic Japanese cinema with subtitles have only one way to do so: somebody has to rent a copy of a movie and rent the theater—paying $420 to do both of those things—and then show the movie, charging admission. No matter how many people show up to the theater the cost of showing the movie remains the same: $420.

You are conducting market research to discover the shape of the demand curve. You determine that there is nobody who will pay a price of $60, 1 who will pay $59, 2 who will pay $58, and so on down until you hit $10, at which point there will be 50 willing to pay to see the movie. Then 60 people will be willing to pay $9, 70 in total will be willing to pay $8, 80 will be willing to pay $7, 90 will be willing to pay $6, 100 will be willing to pay $5, 110 people will be willing to pay $4, 12- will be willing to pay $3, 130 will be willing to pay $2, 140 will be willing to pay $1, and 150 will come if it is free.

Suppose that the profit-−making Monopolist Entrepreneurial Company is thinking of entering the business as the only—the monopoly—seller of opportunities to see classic Japanese cinema in the benighted, fog-−bound, and redwood-−infested town of Ihavefoundit. They hire you to analyze the situation given your extensive market research. They ask:

a. What price maximizes profits for the Monopolist Entrepreneurial Company?

**Fixed cost $420. No variable cost whatsoever: marginal cost is zero.**

**Two branches to the demand curve:**

**QD = 1 x (60 - P) as long as P ≥ 10**

**QD = 10 x (15 - P) as long as P ≤ 10**

**If the firm chooses to produce on the first branch, profit maximization implies: P = $30 -- QD = 30 = $900 in revenue, $480 in profits**

**If the firm chooses to produce on the second branch, profit maximization implies: P = $7.50 -- 75  75 x $7.50 = $562.50 in revenue $142.50 in profits**

**The firm will choose to produce on the first branch. P = $30, Q = 30**

b. What profits will the MEC make at that price?

**$480 in profits**

c. What is the consumer surplus for that price?

**Average valuation is $45**

**Cost to consumers is $30**

**$15 x 30 = $450 is consumer surplus**

d. What is the total social surplus for that price?

**$450 + $480 = $930 is the total social surplus**

**D. Monopoly:** In the same setup as the previous problem, the Redwood Cinema Collective says that it is bad for the MEC to profit from the love of the citizens of ihavefoundit for subtitled Japanese classic cinema and proposes that they run the movies as a break-even nonprofit.

a. What price will they charge?

**The firm needs to produce along the second branch of the demand curve and make a profit. Revenue = P(10 x (15 - P)) = 420**

**150P - 10P^2 = 420**

**15P - P^2 = 42**

**P^2 - 15P + 42 = 0**

**P = 15/2 ± SQRT((225-168)/4) = 15/2 ± SQRT(14.25) 7.5 - 3.8 = 3.7**

b. How many people will come to the cinema?

**Q = 10 x (15 - 3.7) = 113**

c. What is the consumer surplus?

**Along first branch of demand curve, 50 people with an average valuation of 35 go to the theater. Along the second branch of the demand curve, 63 people with an average valuation of 6.8 go to the theater. 50 x (35 - 3.7) + 63 x (6.8 - 3.7) = 1760 equals consumer surplus**

d. Which arrangement--unregulated monopoly or efficient nonprofit--do you prefer? Why?

**The $1340 of efficient nonprofit social surplus beats the $930 private monopoly social surplus hands down.**

**E. Utility Theory:** Suppose we have students going to Euphoric State University who spend their money on only two things all semester: yoga lessons Y and lattes L. Suppose that Channing T. has a Cobb-Douglas utility function of the form:

$$U = Y^{(\theta)}L^{(1-\theta)}$$

Suppose that the price of a yoga lesson is $20 and the price of a latte is $5, and that in a week Channing T. buys 4 times as many lattes as she takes yoga lessons. If his preferences are consistent, what is his personal θ?

**Channing spends the same amount on lattes as on yoga lessons--and has apparently undergone a "gender reassignment". Thus θ=0.5**

**F. National Income Accounting:** Explain whether or not, why, and how the following items are included in the calculation of GDP:

a. Fees paid to Google to buy advertisements. **No. intermediate good.**

b. Fees earned by real estate agents selling newly-built homes. **Yes. Consumer service.**

c. Medicare payments to doctors by the government. **Yes, government purchases.**

d. Repair of an old dam by the Army Corps of Engineers. **Yes. Government purchases.**

f. Rent paid on an already-built house. **Yes. Consumer service**

**G. Keynesian Cross:** Consider the simple Keynesian closed-economy income-expenditure model; Y=C+I+G. The idea is that if production and national income Y is less than or greater than spending C+I+G, production and income will rise or fall until they are equal. Suppose C = 5 + 0.666Y

a. G=3, I=2: what is Y? **Multiplier of 3, so Y=30**

b. I falls by 0.5: what happens to Y? **Multiplier of 3, so Y falls by 1.5**

c. I recovers and rises by 0.3, but G falls by 0.3: what happens to Y? **Y is unchanged**

d. I falls by 0.25: what happens to Y? **Multiplier of 3, Y falls by 0.75**

f. I recovers and rises by 0.2, but G falls by 0.3: what happens to Y? **Y falls by 0.3**

**H. Phillips Curve:** In the Phillips Curve framework in which $\pi = E(\pi) + \beta(u^* - u)$—the inflation rate $\pi$ equals the previously- expected inflation rate $E(\pi)$ plus the "slope" $\beta$ times the difference between the natural rate of unemployment $u^*$ and the actual rate of unemployment u—and in which this year's expected inflation $E(\pi)$ is last year's actual inflation, calculate the rate of inflation $\pi$:

a. In the first year, if the starting $E(\pi)$=2% per year, $\beta = 1/2$,$u^*$=5%, and u=5%

**2%**

b. In the second year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part a—$\beta = 1/2$, u = 5%, but structural changes in the economy raise $u^*$ to 7%

**3%**

c. In the third year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part b—$\beta = 1/2$, u = 5%, but structural changes in the economy keep $u^*$ at 7%

**4%**

d. In the fourth year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part c—$\beta = 1/2$, u = 5%, but structural changes in the economy keep $u^*$ at 7%.

**5%**

e. What should the government and central bank do if they want to keep inflation from rising?

**Allow unemployment to rise to the natural rate.**

**I. Economic Growth:** In 8300 BC there were roughly 5 million people in the world—with an average standard of living of about $500/year. In 1700 there were roughly 640 million people in the world—with an average standard of living of about $500/year. In 1900 there were roughly 1.6 billion people—with an average standard of living of about $565/year. Today there are roughy 7.2 billion people—with an average material standard of living of $8035 dollars per year.

a. Use the *Rule of 72* to calculate the average population growth rate and the average global real GDP growth rate between 8300 BC and 1700 AD.

**10000 years, growth factor of 128 means 7 doublings, a doubling every 1400 years, that means an annual growth rate of 0.05%/year**

b. Use the *Rule of 72* to calculate the average global real GDP growth rate between 1700 and 1900 AD.

**200 years, growth factor (1.6 x 565)/(.64 x 500) = growth factor of 2.825 = 2 x 1.41 = 2 x sqrt(2) means 1.5 doublings. Hence one doubling every 133 years, which means a growth rate of about 0.5%/year**

c. Use the *Rule of 72* to calculate the average global real GDP growth rate between 1900 and 2012.

**112 years, growth factor (7.2 x 8035)/(1.6 x 565) = 64 means 6 doublings means a doubling every 18.67 years means a growth rate of 3.9%/year**

d. How much faster has global real GDP growth been over 1900-2012 than it was over 8300 BC-1700 AD?

**3.9/.05 = 78 times as fast**

e. How much faster has global real GDP growth been over 1900-2012 than it was over 1700-1900?

**7.8 times as fast**

f. What would global real GDP be in 2100 if it were to grow as rapidly between now and 2100 as it grew from 1900-2012?

**Over 88 years we would have almost five additional doublings--call it halfway between 4 1/2 and 5. 4 1/2 doublings would get us to a global real GDP of $1310T. 5 doublings would get us to $1850T. Call it $1580T**

g. If there are 10 billion people in the world in 2100 and if global real GDP be in 2100 if it were to grow as rapidly between now and 2100 as it grew from 1900-2012, what would average living standards be in 2100?

**$158,000 per person per year in income**

h. Why do they call it the "Industrial Revolution"?

**It marked a change from a poor world to a world that is--potentially--very very rich.**