Econ 115: Problem Set 2 with Answers

Spring 2017: Due May 1, 2017

Problem 1: The Longer Depression of 2008-?

In 2007 for the (real) GDP of the post-industrial North Atlantic economies as a whole, the situation roughly corresponded to the following values for the quantities in our summary macroeonomic national income equation:

$$Y = E = \mu[c_0 + I_0 + NX] - \mu I_r \times r + \mu G$$

$Y = E$ = aggregate demand, total spending, national income, GDP
μ = multiplier = 2.5 (at the level of the North Atlantic as a whole)
NX = net exports = 0 (at the level of the North Atlantic as a whole)
I_r = sensitivity of investment spending to the interest rate = 200 (i.e., a 1%-point rise in the interest rate reduces investment spending in a year in the North Atlantic as a whole by $2 trillion)
c_0 = consumer confidence = $2 (trillion)
I_0 = business investment committees' "animal spirits"—their optimism or pessimism = $18 trillion
r = long-term risky real interest rate relevant for investment planning = nominal interest rate minus expected inflation = 5% (0.05)
G = government purchases = $10 (trillion)

And note that, in general, each move by central banks to push the short-term safe nominal interest rate i that they control up or down induces half as large a move in the long-term risky real interest rate r that they influence.

(a) What was the equilibrium value of $Y = E$ = aggregate demand, total spending, national income, GDP in the North Atlantic as a whole?

$$\textcolor{red}{Y = E = \mu[c_0 + I_0 + NX] - \mu I_r \times r + \mu G}$$

$$\textcolor{red}{Y = E = (2.5)[\$2 + \$18 + \$0] - (2.5)(200)(0.05) + (2.5)(10)}$$

$$\textcolor{red}{Y = E = 2.5 \times 20 - 2.5 \times 10 + 2.5 \times 10 = 2.5 \times 20 = \$50 \text{ (trillion)}}$$

(b) During 2008 and the winter of 2009 the central banks of the North Atlantic reduced the interest rate they control—the i, the short-term safe nominal interest rate—from its 2007 value of 5% as far as they could. But in general central bank reductions in the short-term safe nominal interest rate i induce only half as large a reduction in the real interest rate r: financiers and others believe that such monetary policy moves are not permanent but transitory, and will be reversed in relatively short order. So how much of an upward push did this shift in monetary policy give to North Atlantic annual real GDP?

Central banks cannot reduce the interest rate they control—the i—below zero. So they reduced i by 5%-points to 0, and that reduced r by 2.5%-points. This then was multiplied by the 200 interest sensitivity of investment I_0 to give \$5 (trillion), which was then multiplied by the 2.5 multiplier μ to give \$12.5 (trillion) of upward pressure on annual real North Atlantic region GDP.

(c) 2008 and 2009, however, saw the real interest rate r not fall but rise by 2%-points: the reduction in interest rates was not large enough to offset the effects on businesses' borrowing costs of the financial crisis. So how much of an downward push did movements in real interest rates in total give to North Atlantic annual real GDP?

Central bank policy and the financial crisis together boosted r by 2%-points. This then was multiplied by the 200 interest sensitivity of investment I_0 to give \$4 (trillion), which was then multiplied by the 2.5 multiplier μ to give \$10 (trillion) of downward pressure on annual real North Atlantic region GDP.

(d) Before austerity began, in 2009, North Atlantic governments in total raised government purchases by \$1 (trillion). What was the net effect of everything—financial crisis, active economy-boosting monetary policy, and increases in government purchases—on North Atlantic real annual GDP?

\$4 (trillion) of downward pressure from the fall in investment spending resulting from the financial crisis and monetary policy. \$1 (trillion) of upward pressure from government purchases. net of -\$3 (trillion) in downward pressure, which then has to be multiplied by the 2.5 multiplier μ to give a -\$7.5 (trillion) fall in North Atlantic annual real GDP.

(e) Today North Atlantic annual real GDP is still $5 (trillion) below its normal late-business cycle expansion potential benchmark as achieved in 2007. Today austerity has depressed government purchases by $2 (trillion) below the 2007 benchmark, and real interest rates are now still 2%-points (0.02) below their 2007 benchmark. If there had been no other changes relative—no changes to consumer confidence c_0, business "animal spirits" I_0, or North Atlantic net exports NX—we would expect North Atlantic annual real GDP to be not $5 (trillion) below its normal ate-business cycle expansion potential benchmark, but where?

-$2 (trillion) of downward pressure from fiscal austerity but plus $4 (trillion) of upward pressure on investment spending from monetary ease multiplied by the multiplier of 2.5 would lead us to expect a level of annual real GDP not $5 (trillion) below but rather $5 (trillion) above the benchmark.

(f) Bankers, goldbugs, and others—including campaign-season Donald Trump—call for North Atlantic central banks to reverse their policies of "excessive monetary ease" and raise the interest rate i they control by 4%-points to "normalize" real interest rates and properly reward savers. What effect would such a policy shift by the North Atlantic governments have on North Atlantic annual real GDP relative to potential?

There is already a $5 trillion output gap. Raising the short-term safe nominal interest by 4%-points would probably raise the long-term risky real interest rate r by 2%-points, which would put $4 (trillion) of downward pressure on investment spending, which with a multiplier of 2.5 would raise the output gap from $5 trillion to $15 trillion.

(g) Last week President Donald Trump reversed his campaign position on the Federal Reserve and interest rates.

During the campaign he said that Federal Reserve Chair Janet Yellen was keeping interest rates low "because she's obviously political and doing what Obama wants her to do. What [the Federal Reserve] are doing is, I believe, s a false market. Money is essentially free…"

Last week he said, instead: "'I do like a low-interest rate policy, I must be honest with you…. Asked if Ms. Yellen was 'toast' when her term ends in 2018, Mr. Trump said, 'No, not toast. I like her, I respect her. It's very early…'"

What do you think Treasury Secretary Steve Mnuchin and Chief Economic Advisor Gary Cohn said to Donald Trump to produce this change?

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Problem 2: Trade with Mexico

In 2018 Mexican GDP will be about $1.2 trillion and U.S. GDP will be about $20 trillion. Exports from Mexico to the United States excluding re-exports—i.e., excluding the value of products made in the United States and exported to Mexico for further reprocessing and then brought back here—will be about $120 billion. Let's set the expected price of Mexican exports if nothing happens, that is, under NAFTA, is equal to 1—so that the expected quantity of exports will be $120 billion of real goods and services.

Suppose that the demand curve by American consumers for Mexican products in 2018 is:

$$P_d = 3 - Q_d/60,$$

where P_d is denominated in index numbers and Q_d is denominated in billion real-goods dollars a year.

And suppose that the supply curve is:

$$P_s = 0 + Q_s/120$$

where again P_s is denominated in index numbers and Q_s is denominated in billion real-goods dollars a year.

(a) What is the equilibrium price and quantity of Mexican exports (excluding re-exports) to the United States under NAFTA?

P* = 1, Q* = ($V)120 (billion)

(b) What is the equilibrium consumer surplus to U.S. consumers and producer surplus to Mexican exporters under NAFTA?

CS = 120 x (3-1)/2 = $120 (billion)
PS = 120 x (1-0)/2 = $60 (billion)

(c) Suppose that Donald Trump abrogates NAFTA, imposes an embargo on trade with Mexico as a bargaining ploy (don't laugh: Thomas Jefferson did it), and trade for 2018 shuts down. Who loses the most? Why?

U.S. consumers of Mexican products lose $120 (billion) in lost consumer surplus as they scramble to purchase the goods they buy from Mexico from other producers. Mexican producers lose $60 (billion) as they scramble to find alternative markets.

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(d) But who loses most proportionally?

Mexican losses are on the order of 5% of GDP. U.S. losses are on the order of 0.6% of GDP

(e) Suppose that Secretary of State Rex Tillerson persuades President Donald Trump that cable newscasters will beat up on him badly for breaking the U.S.'s word, but that an alternative policy would be asking Mexico to impose VERs—voluntary export restraints—and that Mexico agrees to cut back its exports in 2018 to $60 billion in real good quantity as long as it can sell them for what the market will bear. What is the export-quota equilibrium price and quantity? What is the export quota producer and consumer surplus?

If Mexico restricts exports (excluding re-exports) to ($V)60 (billion), the equilibrium price $P^{VER} = 2$—Mexico still collects $120 billion from its exports to the U.S. even though it is exporting half as many goods. And, of course $Q^{VER} =$($V)60 (billion).

For producer surplus, the average opportunity cost is 0.25, and the price at which exports are sold is 2. Thus:

$PS^{VER} = 60 \times (2 - 0.25) = \$105$ billion—greater than the $60 billion PS received by Mexicans under NAFTA.

For consumer surplus:

$CSVER = 60 \times (3-2)/2 = \$30$ billion—U.S. consumer surplus is cut by 3/4.

The net effect is to impoverish the United States by $90 (billion) of lost consumer surplus and to increase Mexican producer surplus by $45 billion.

Problem 3: NIMBYism in Greater San Francisco

Suppose that the supply curve for housing in an American sunbelt megacity is:

$$P = 0.125 \, Q$$

where P is the price per month per bedroom of an attractive central location, and Q is the number of bedrooms—the number of people—in millions. (People in less attractive locations get a discount, and people who own rather than rent have a more complicated problem. But for simplicity assume that we can represent this whole market by just one supply curve and one demand curve.)

(a) Demand for housing in a west coast sunbelt city—call it Ellay—is:

$$P = 4 - 0.125 \, Q$$

where, once again, P is the price per month per bedroom of an attractive central location, and Q is the number of bedrooms—the number of people—in millions. What is the equilibrium price? The equilibrium quantity? The consumer surplus? The producer surplus?

Q* = 4/0.25 = 16 (million)
P* = \$2 (thousand per month)
PS = 16 x (2-0)/2 = \$16 (billion per month)
CS = 16 x (4-2)/2 = \$16 (billion per month)

(b) Now let's consider another west coast megacity: call it Esseff. The supply curve and the demand curve for housing in Esseff are the same as in Ellay. But local politics have given control over zoning to the NIMBY lobby—Not In *My* Back Yard—and so the housing stock in Esseff is fixed by government regulation at a maximum of 6 million bedrooms. Suppose rent control has been outlawed—landlords lucky enough to have built can charge what the market will bear. What is the equilibrium price? The equilibrium quantity? The consumer surplus? The producer surplus?

Q* = 6 (million)
P* = \$3.25 (thousand per month)
CS = 6 x (4-3.25)/2 = \$2.25 (billion per month)
PS = 6 x (4+2.5)/2 = \$19.5 (billion per month)

(c) Are landlords as a class happy or unhappy that Esseff has powerful zoning and growth restrictions—that Esseff is not Ellay? How happy or unhappy are they?

Landlords as a class are happy that Esseff is not Ellay—they collect $19.5 billion a month in rents, while in Ellay landlords as a class collect only $16 billion a month.

(d) Are people trying to live in Esseff as a class happy or unhappy that Esseff has powerful zoning and growth restrictions—that Esseff is not Ellay? How happy or unhappy are they?

People trying to live in Esseff have a much worse deal: they receive only $2.25 billion a month in consumer surplus, compared to the $16 billion per month that they would collect were Esseff like Ellay.

(e) Why doesn't the net happiness or unhappiness that Esseff is not Ellay sum up to zero?

Because the zoning restrictions do not just raise the market price and so transfer wealth from renters to landlords: they also block a great many housing units that would be advantageous for people wanting to move to Esseff to occupy and profitable for landlords to build.