ECON 110, Prof. Hogendorn

Problem Set 8

1. *Botswana.* Let's consider the IMF's policy toward Botswana (criticized by Joseph Stiglitz in his book *Globalization and its Discontents,* pg. 38). Normalize Botswana's working population to $\mathcal{L} = 100$. Let Botswana initially have a production function $y = f(L) = 380L^{1/2}$, and assume the firms represented by this function are owned by the workers. Set the price of y equal to 1.

   (a) Find the equilibrium real wage in Botswana's labor market and graph the labor market. Also graph the production function.

   (b) Private Botswanans were saving 700. The government was spending 25% of GDP and collecting taxes of 25% of GDP. Firms' investment demand function was $I = \frac{7630}{r}$. We will ignore foreign capital flows (actually, they were considerable in real life). Graph the capital market, showing the private, government, and total savings curves and the investment curve. What was the real interest rate?

   (c) Stiglitz claims that Botswana faced two negative shocks in 1981 due to drought and problems in the diamond industry. We'll model this by saying that the production function changed for the worse to $y = f(L) = 350L^{1/2}$. What was the new real wage and the new output?

   (d) The government of Botswana collected taxes of 25% of the new, lower real GDP, but it did not take the IMF's advice and continued to spend the same real amount as before the shocks. Real private saving and investment demand remained unchanged. Graph what happened in the capital market and find the new real interest rate.

(e) The neoclassical model suggests that real wages in Botswana will grow more slowly as a result of the government's decision in (c). Why? What is an argument against this view?

2. *GrowingChina.* This problem discusses the Malthusian trap that has worried China for centuries and that the country now seems to have escaped. Let there be $\mathcal{L} = 1000$ Chinese workers who inelastically supply labor and who spend all of their income on rice. These workers own the Chinese rice firms which have aggregate production function $Y = f(L, K) = A(hL)^{2/3}K^{1/3}$. (Aggregate meaning we treat all the firms as if there were just 1.) Let $A = 3.33$, $h = 1$, $p = 1$ and let $K = 729$. Note that the Chinese capital stock is constant until part (d) of this problem.

(a) Find the equilibrium real wage and graph the labor market.

(b) Verify that there is also equilibrium in the rice market and graph the production function. What is output per worker $(Y/\mathcal{L})$?

(c) Suppose that over several years, the Chinese workforce rises to 1,728 workers. If nothing else changes, what is the new general equilibrium (the new wage and the new output per worker)? Why don't these new workers produce enough to keep the output per worker at least as high as before?

(d) Consider the following changes to the production function: an increase in A, an increase in K, and an increase h. How would each of these help China escape the Malthusian trap? What is the name for each of these sources of growth?

3. *SW25.3* While gardening in his backyard, Bob finds a jar containing $100,000 in cash. He deposits the money in his bank, where the reserve requirement is 5%. Show the relevant changes on the bank's balance sheet. How much will the money supply eventually increase due to Bob's deposit? How would your answer be different if Bob only deposited $95,000, keeping $5,000 in cash to himself?

4. *AIG.* AIG is the world's largest insurance company, and it is also in financial trouble. As of September 30, 2008, AIG's simplified balance sheet looks approximately like this (all figures in billions):

Assets	Liabilities
$400 financial securities	$913 general liabilites
	$38 government loan
$622 other assets	$71 net worth
$1022	$1022

   (a) Since September, things have gotten worse. It turns out that $50 of the other assets are distressed, and can no longer be counted as assets. Rewrite the balance sheet, and find the new net worth.

   (b) Things get worse. There has been a decline of 10% in the financial securities. Also, AIG now has a new liability of $35 in credit default swaps it must pay insurance on. Again rewrite the balance sheet and show the net worth.

   (c) Yesterday, the government announced a new bailout plan. One thing the government will do is buy the $50 in distressed assets at their full face value by giving AIG $50 in cash. Show how this changes the balance sheet.

   (d) The other terms of the government plan are to lend AIG $60 (a new liability). AIG will take this cash and pay off the credit default swap liability. Also, the government will buy $40 in shares in the company (again, giving AIG cash). How does this change the balance sheet.

Review Problems only, not to turn in:

5. *Fear.* This problem shows how in the neoclassical long-run macro model, widespread fear across an economy will not cause a recession! This is

an important and comforting insight for the long run, but on the other hand, in the long run we are all dead...

Suppose the production function for the one representative firm in the economy is $Y = f(L) = 20L^{4/5}$. This firm also has investment demand $I(r) = 0.8/r$.

There are $\mathcal{L} = 40$ workers who inelastically supply labor. These workers collectively supply savings of $\mathcal{S} = 10$ units of output. (Again, that's total savings of all 40 workers.)

(a) Show that the labor demand curve is $L(w) = (16/w)^5$, graph the labor market, and show the equilibrium real wage. Also graph the capital market and show the equilibrium real interest rate.

(b) Verify the national income accounts identity, i.e. that income from wages and dividends(which equals consumption plus savings) equals output (consumption plus investment).

(c) Now suppose that people in this country hear about the U.S. Financial Crisis and worry that some horrible thing could happen to them too. Everyone becomes very fearful of the future. The consumers all increase their savings to $\mathcal{S}' = 20$ to prepare for bad times ahead. The firm decreases its investment demand to $I(r) = 0.4/r$ due to pessimism. The firm also shifts down its labor demand curve to $L(w) = (8/w)^5$ – even though this is not profit maximizing because the production function remains unchanged. What happens to the real wage, real interest rate, income, and output?

6. *OldGermansSave*. As in OldGermans, there are 243 German workers who inelastically supply labor, but now they save 100 beers (in total) for the future and spend the rest of their income on beer consumption. These workers own the German beer firms which have aggregate production function $f(L) = \frac{54}{4}L^{4/5}$. The German beer firms have ag-

gregate investment demand of $I = 1200/r$, where r is the real interest rate. Let $p = 1$.

(a) Find the equilibrium real wage in the labor market and graph the labor market. Verify that there is also equilibrium in the beer market and graph the production function.

(b) Graph the capital market. What is the equilibrium real interest rate?

(c) What happens if Germans become more pesimistic and start saving 110 beers?

(d) Go back to just 100 beers saved. What happens if the German government levies taxes of 60 beers but German Chancellor Angela Merkel drinks 80 beers?

7. *LittleT.* A bank has deposits of $50 million, loans of $52 million, and complies with a 10% reserve requirement. Assuming this bank is properly run, write its T-account.

8. *SW25.2* Down Home Savings Bank has the following assets and liabilities: $6 million in government bonds and reserves, $40 million in deposits, $36 million in outstanding loans. Draw up the balance sheet for the bank. What is its net worth?

Answers to Review Problems:

5. *Fear_a.*

(a) Firms maximize profits by setting the marginal product of labor equal to the wage:

$$f'(L) = w \Rightarrow \frac{4}{5}20L^{-1/5} = w \Rightarrow L^{-1/5} = \frac{w}{16} \Rightarrow L(w) = \left(\frac{16}{w}\right)^5$$
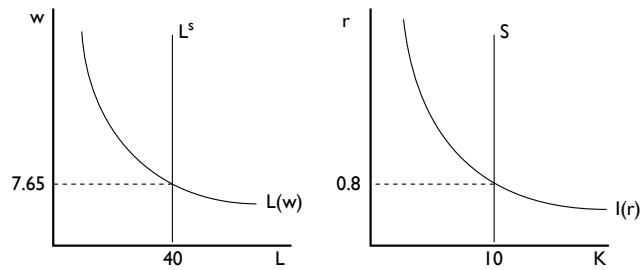
(b) Since the labor market clears, employment is 40, and output is
$Y = f(40) = 382.5$.

Income is equal to wages plus dividends. Wages are $w^L = 7.65 \cdot 40 = 306$.
To find dividends, we need to find the profits of the firm:

$$\Pi = pq - wL = 1 \cdot 382.5 - 306 = 76.5$$

So total income is $306 + 76.5 = 382.5$ which does indeed equal
output.

(c) The new capital market equilibrium occurs where $20 = 0.4/r \Rightarrow r = 2\%$.
The labor market now equilibrates off the new, irrational labor
demand curve, so

$$\left(\frac{8}{w}\right)^5 = 40 \Rightarrow w = 3.83$$

Not surprising, workers' wages fall because the firms' collective
fear has essentially the same effect as if they all colluded to reduce
wages. But since this is a neoclassical model, the labor market
does still clear, and all 40 workers are still employed. That means
that output is still $Y = f(40) = 382.5$.

It remains to be seen if there is really income to pay for this out-
put. Total wages are now only $3.83 \cdot 40 = 153.2$. But firm prof-
its now rise (due to the lower labor costs) to $1 \cdot 382.5 - 153.2 = 229.3$.
Therefore, dividends go up a lot, and total income is still $153.2 + 229.3 = 382.5$,
exactly enough to equal output.

6. *OldGermansSave_a.*

(a) We can find labor demand using $pMP_L = w$, so,

$$1 \cdot \frac{4 \cdot 54}{5 \cdot 4} L^{-1/5} = w \Rightarrow L^d = \left(\frac{54}{5w}\right)^5$$

Setting $L^d = L^s = 243$ gives an equilibrium real wage of $w = 3.6$.
The total costs of the firm are $wL = 3.6 \cdot 243 = 874.8$. The total revenues are $py = 1 \cdot f(243) = 1093.5$. Thus the profits, paid as dividends, are 218.7. The firm's output is 1093.5.

Workers earn total wages of $wL = 874.8$ and total dividends of 218.7. Their total consumption of beer is thus $1093.5 - 100 = 993.5$, and the remaining 100 beers are saved, so there is equilibrium.
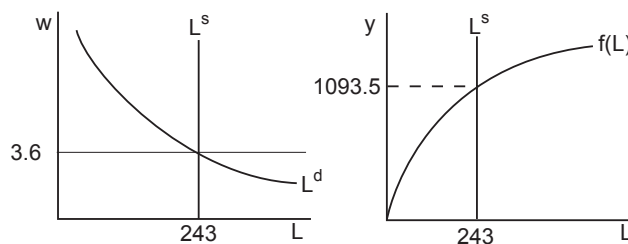
(b) The equilibrium real interest rate is found by setting

$$I = S \Rightarrow \frac{1200}{r} = 100 \Rightarrow r = 12\%$$
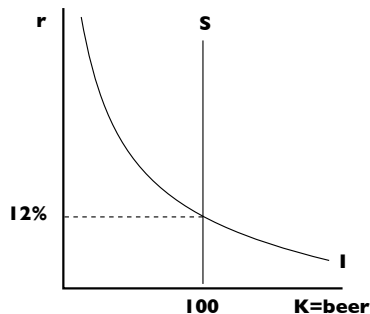
(c) The higher savings reduces the real interest rate:

$$I = S \Rightarrow \frac{1200}{r} = 110 \Rightarrow r = 10.9\%$$

(d) Consumption of beers falls to $1093.5 - 100 - 60 = 933.5$. Private savings stays the same at 100. Government spending is 80, so $T - G = -20$, i.e. the government runs a deficit. National saving is then $100 - 20 = 80$. The real interest rate rises to

$$I = S \Rightarrow \frac{1200}{r} = 80 \Rightarrow r = 15\%$$

Note that the government deficit fully crowds out private investment, which falls from 100 to 80.

7. *LitteT_a.* The T-account is:

Assets	Liabilities
$52 million loans	$50 million deposits
$5 million reserves	$7 million net worth
$57 million	$57 million

8. *SW25.2_a* The balance sheet is:

Assets	Liabilities
$6 million bonds and reserves	$40 million deposits
$36 million loans	$2 million net worth
$42 million	$42 million