

**PROBLEM SET 6 Solutions**  
**14.02 Principles of Macroeconomics**  
**April 20, 2005**  
**Due April 27, 2005**

**I. Answer each as True, False, or Uncertain, providing some explanation for your choice.**

1. If consumers and investors are forward-looking, a one-time increase in the level of the nominal money stock only shifts the LM curve.

**False.** By money neutrality, output will be back to the natural level of output. Since it takes time for output to be back to the medium-run level, the transition from the short run to the medium run implies higher-than-original output for awhile. If agents are forward-looking, they will take periods of expected higher output into account and increase consumption and investment today. As a result, IS shifts. Notice that in the text, if we assume that the second period to be the medium-run period, of course it will have no impact on today's IS. But in general, the second period can be any time between today and the medium-run period.

2. Increases in current and expected future *nominal* interest rates do not lead to an increase in financial wealth, if current and expected *real* interest rates are unchanged.

**False.** Recall that bonds are claims to dollars, rather than goods in the future. If consumers hold bonds, increases in current and expected future nominal interest rates imply lower bond prices, and lower financial wealth.

3. A country can have exports larger than its GDP.

**True.** Suppose that the only value added in a country is its labor input. If it imports intermediate goods and transforms them into final goods using only labor, it is possible that the value of exports is higher than the value added to the final goods (which also equals labor income here). See the Focus box "Can Exports Exceed GDP?" P.376 for an example.

4. If inflation in the U.S. is higher than that in Japan, the nominal exchange rate (measured as the price of dollars in terms of yens) decreases.

**False/ Uncertain.** At first sight, it seems that the nominal exchange rate is independent of the change in relative prices of the two countries, ie. their inflation rates. (if you mention this part only, you still get full credit.) However, for a given nominal interest rate in Japan and a given expected nominal exchange rate, the interest parity condition requires the nominal exchange rate to be positively correlated with the U.S. nominal interest rate (an upward sloping UIP curve in a (E,i) plane). Since a higher inflation in the U.S. can be due to a fiscal or a monetary policy shock, the nominal interest rate can increase or decrease. Thus, the nominal exchange can also increase or decrease. (The second part of the answer is from Chapter 20)

5. A country's GNP is equal to its GDP if its trade balance is 0.

**False.** Recall that GNP corresponds to the value added by domestically owned factors of production. By definition, GNP is equal to GDP plus net factor payments from the rest of the world. Even though trade balance is equal to 0 (ie. import=export), a country can have positive or negative net factor payments. For example, if a country has a lot of firms owned by foreign investors but does not have much ownership of firms abroad, its GNP is smaller than GDP because factor payments to foreigners are higher than the factor payments received from the rest of the world.

6. In theory, a capital account deficit implies a current account deficit.

**False.** By definition, the capital account is equal to the negative current account. Thus, a capital account deficit implies a current account surplus.

## II. The Budget Deficit in Denmark

Consider the following statistics for Denmark in the 1980s. (Source: "Can Severe Fiscal Contractions Be Expansionary? Tales of Two Small European Countries," NBER Macroeconomics Annual, 1990, 75-110, by F. Giavazzi and M. Pagano.)

	1979-1982	1983-1986
Average growth rate of public consumption	4.0%	0.9%
Public debt as % of GDP	10.2%	0.0%
Average growth rate of disposable income	2.6%	-0.3%
Average growth rate of private consumption	-0.8%	3.7%
Average growth rate of business investment	-2.9%	12.7%

1. The Danish government made some fiscal policy changes at the end of 1982 and at the beginning of 1983. From the numbers above, what do you think they did?

**Ans:**

The Danish government cut government consumption (spending) at the end of 1982 and at the beginning of 1983, as illustrated by a decrease in the average growth rate of public consumption from 4.0% to 0.9%. They succeeded in reducing the public debt by more than 10% in a few years. (Public debt as % of GDP decreased dramatically from 10.2% to 0%)

Also, a decrease in the average growth rate of disposable income (from 2.6% to -0.3%) coupled with an increase in output growth implies that tax rates were raised around that period. Notice that with an increase in tax rates, a higher growth rate of GDP from 1983 to 1986 increased tax revenue and shrank the budget deficit further.

2. If we employ the standard IS-LM model (without expectations), ie. with  $C = C(Y - T)$  and  $I = I(Y, r)$ , the impact of a decrease in government consumption on business investment is ambiguous. Explain.

**Ans:**

If we impose the restriction that investment can only react to the contemporaneous output and real interest rate, a decrease in government consumption/spending decreases aggregate demand and thus the equilibrium output. The real interest rate needs to drop to clear the money market. On one hand, a lower real interest rate is associated with a higher level of investment. On the other hand, a lower level of output implies lower investment. The net effect on investment is ambiguous.

3. Instead, we observe a drastic increase in business investment (its growth rate increased from -2.9% to 12.7%). How can an inclusion of expectations in the standard IS-LM model help in explaining such an unambiguous increase in investment?

**Ans:**

We know that output in the medium run will be back to its natural level. A decrease in government spending and a lower natural rate of interest implies an increase in investment in the medium run. If investors form expectations on events during the transition from the short run to the medium run, they will take future increases in output and investment into account and react to the contemporaneous decrease in output less. Also, in the long run, a higher capital to output ratio leads to a higher long-run output. If investors look forward to the long-run, they react even lesser to the contemporaneous decrease in output.

4. If we employ the standard IS-LM model (without expectations), ie.  $C = c_0 + c_1(Y - T)$ , a decrease (both growth rates and levels) in disposable income triggers a decrease in private consumption. How can an inclusion of expectations in the standard IS-LM model help in explaining the observed increase in private consumption growth (from -0.8% to 3.7%)?

**Ans:**

In the medium run, we know that output will be back to the natural level of output. A decrease in government spending implies a lower short-run output, but also a gradual increase in output back to the natural level. If consumers take the future increase in output into account (between now and the medium-run), they will react less to the contemporaneous decrease in output. If the impact of expectations dominate, they may even increase private consumption in the short run.

Now you are told that the long-term real interest rates for that period are the following.

	1979-1982	1983-1986
Real interest rate	6.7%	3.3%

5. What happened to the present value of an average consumer's expected financial wealth by 1986? Can this change in financial wealth help explain the increase in private consumption, even though the average growth rate of disposable income decreases (from 2.6% to -0.3%)? If so, why?

**Ans:**

Yes. The present value of an average consumer's expected financial wealth increased as a result of a decrease in the real interest rate, because she discounted her expected future wealth less. According to the life cycle theory of consumption, an increase in permanent wealth implies an increase in present consumption. Even though the growth rate of disposable income decreases this period, the growth rate of private consumption can increase in response to a perceived increase in future wealth. From 1983 to 1986, the Danish consumers became more optimistic and might even choose to borrow against the future to finance their present consumption.

### III. The Yen and the Dollar

1. You will go to Japan tomorrow. Before departure, you go to the bank, cash out all your saving of \$3000 and exchange that for ¥306,000. What is the nominal exchange rate  $E$  (the price of dollars in terms of yens)?

**Ans:**

$$E = \frac{306,000}{3000} = 102$$

2. Once you arrive at the airport in Tokyo, you realize you miss hamburgers already (and it is too early for sushi.) You go to your favorite fast-food chain and buy a hamburger. The hamburger costs ¥306. How much is it in dollars?

**Ans:**

$$P = \frac{306}{102} = 3$$

3. What is the real exchange rate  $\epsilon$  (measured as the price of hamburgers in the United States in terms of hamburgers in Japan) if the price of a hamburger (exactly the same kind) in the U.S. is \$2.

**Ans:**

$$\epsilon = E \frac{P^*}{P} = 102 * \frac{2}{306} = \frac{2}{3}$$

ie. A hamburger in the U.S. can only buy you 2/3 hamburgers in Japan.

4. After the trip, you have ¥100,000 left, and the nominal exchange has decreased to 100. Did the dollar depreciate relative to the yen?

**Ans:** Yes. Because each yen is worth more than before, or equivalently, each dollar buys you less yen.

5. You are now considering whether you should invest the money left *either* in Japanese one-year bonds or U.S. one-year bonds. The U.S. one-year nominal interest rate is  $i_t$  (not in percentage), while that for Japan is  $i_t^*$  (not in percentage). Write down the condition so that you choose to buy U.S. bonds instead of Japanese bonds. Explain intuitively why you need this condition.

**Ans:**

$$(1 + i_t) \geq (1 + i_t^*) \left( \frac{E_t}{E_{t+1}^e} \right)$$

If I spend one dollar to buy U.S. bonds, I will get  $1 + i_t$  in one year. If instead, I spend 1 dollar to buy Japanese bonds, ie.  $E_t$  yens, I will get  $(1 + i_t^*) E_t$  yens in a year. In expected terms,  $(1 + i_t^*) E_t$  yens equal  $(1 + i_t^*) \left(\frac{E_t}{E_{t+1}^e}\right)$  dollars in a year. A year from now, if  $1 + i_t$  is larger than  $(1 + i_t^*) \left(\frac{E_t}{E_{t+1}^e}\right)$ , I should prefer to buy U.S. bonds.

If the above condition holds as an equality, I am indifferent between buying either of them. The equality condition is called the uncovered interest parity condition (UIP).

6. A minute before you make the decision, you hear from the news that the Japanese economy will do great this year and the yen will become "stronger." How does this affect your decision in (5)?

**Ans:**

If the yen is expected to be stronger relative to the dollar,  $E_{t+1}^e$  decreases. A higher  $\frac{E_t}{E_{t+1}^e}$  makes the condition in (5) less likely to hold. I am more likely to buy Japanese bonds today. If the condition was held as an equality before, Japanese bonds are expected to be more profitable and I buy them instead.

7. In theory, arbitrage requires that the condition you have in (5) holds as an equality. Give a reason why it may not hold as an equality in reality.

**Ans:**

It ignores transaction costs. For example, buying Japanese bonds requires an exchange of U.S. dollars to Japanese yens. When the bond matures, an exchange from yen back to dollars is also needed.

It ignores risks. The exchange rate a year from now is uncertain. If the exchange rate is expected to be volatile in the coming year, holding Japanese bonds is risky and risk-averse investors demand a higher return than what is promised by the UIP.