

## Midterm Exam I: Answer Sheet

## Instructions

*Read the entire exam over carefully before beginning. The value of each question is given. Allocate your time efficiently given the price schedule that is imposed. There are no trick questions.*

1. (20%) Country X had a current account surplus of \$25 billion and a nonreserve capital account surplus of \$10 billion in 2002.

- (a) *What was the balance of payments ("above the line") of X in that year? What happened to the country's net foreign assets?*

brief answer Above the line the BoP was +\$35 billion = \$25 billion + \$10 billion. Net foreign assets rise by \$25 billion the amount of the current account surplus. This is the addition to our net claims on foreigners.

- (b) *Assume that foreign central banks neither bought nor sold X's assets. How did the central bank of X's foreign reserves change in 2002? How would this official intervention show up in the balance of payments accounts of X?*

brief answer The CB of X would have its reserves rise by \$35 billion. This would show up in the official reserves transaction balance as -\$35 billion, offsetting the surplus above the line.

- (c) *How would your answer to (b) change if you learned that foreign central banks had purchased \$2 billion of X's assets in 2002? How would these official purchases enter the foreign country's balance of payments accounts?*

brief answer Reserves would rise by an extra \$2 billion. This would show up in the ORT.

2. (30%) *Use the Two-Country model of interest determination (or the dynamic model of the current account if you like) to answer the following questions. Be sure to provide an explanation of your answer.*

- (a) *What happens to the US current account balance and the world interest rate (today) if a technology shock suddenly raises US productivity?*

brief answer The increase in productivity raises the return to investment in the US. With savings unchanged this causes the US current account balance to deteriorate. In the two country model this causes the real interest rate to increase. Using the dynamic model we would note that starting out with factor price equalization we must have

$$r_t^{US} = \beta A_t k_{t,US}^{\beta-1} = \beta A_t k_{t,J}^{\beta-1} = r_t^J$$

The technology shock would cause  $A_t^{US} > A_t^J$ . Then the rate of return would be higher in the US. Japanese savers would prefer to invest in the US; we would import capital, and our current account would deteriorate. Hence, we would run a trade deficit to acquire this capital. Our capital labor ratio would rise, causing  $r_t^{US}$  to fall due to diminishing returns, while in Japan it would rise due to the fall in  $k$  in Japan. The new equilibrium world interest rate would be higher than before (notice that for a small open economy capital would flow into the country until  $r$  returned to its original level, but in the two-country model  $r$  must rise).

- (b) *What happens to the US current account balance and the world interest rate (today) if it is learned today that a technology shock will raise US productivity next period?*

brief answer If the shock occurs next period investment would still rise this period in anticipation of the higher productivity. So the effects should be the same. Notice that even if investment did not rise right away we might expect US savings to decrease if consumers feeling permanently more wealthy start to consume more today, before current output rises (since productivity does not increase till next period).

- (c) *What happens to the US current account balance and the world interest rate if government spending (on useless activity) suddenly rises in the foreign country?*

brief answer This is equivalent to lesser savings in the foreign country. Its current account balance would deteriorate. The real interest rate would rise so the US current account balance would improve.

- (d) *What happens to the US current account balance and the world interest rate (today) if foreigners suddenly become more thrifty?*

brief answer The answer here is just the opposite of in the previous part. Greater thrift leads to an increase in savings and the foreign current account balance improves. This must reduce the world interest rate.

3. (10%) *Many cross-country studies have found that savings ( $\frac{S}{GDP}$ ) and investment ( $\frac{I}{GDP}$ ) rates are highly correlated in developed economies. Why might this finding be taken to be a puzzle? Explain. Notice that we can calculate  $\frac{S}{GDP}$  and  $\frac{I}{GDP}$  for each country using annual observations, or calculate the average rate for a decade. Do you think the magnitude of the cross-country correlation will be the same in these two cases? Explain.*

brief answer The high correlation is a puzzle because with capital market liberalization national savings does not need to equal national investment. Only the world current account must be in balance. So the high correlation could be taken to mean that capital markets are not as liberalized as supposed. We should expect the correlation to be higher for decade averages. The reason is that countries face inter-temporal budget constraints. Current accounts cannot be in deficit forever. In any given year some shocks could cause countries' current accounts to differ. But over time current deficits ought to be offset by future deficits. So the decade averages will be higher. In any year current account imbalances allow for smoother consumption within countries. But persistent imbalances ought to induce reversals, which leads to higher cross-country correlations.

4. (25%) You have acquired an option to buy Swiss francs at a strike price of \$.70 per franc. The maturity of the option is 90 days, and the spot price of the franc when you bought the option was \$.50.

(a) If the spot price of the franc appreciates to \$.60 will you exercise the option?

brief answer No. It is still not in the money.

(b) If the spot price of the franc appreciates to \$.85 will you exercise the option? Does your answer depend on whether this is day 50 or day 90? Explain.

brief answer If it is day 90 you will exercise the option, and earn \$.15 on each option.

If it is day 50 you could exercise today, but it is better to wait. The reason is that exercising now forgoes any gains if the franc continues to appreciate. Uncertainty about the franc still creates value for this option.

extra analysis Recall that the value of a call option at the termination date is given by  $C_T = \max\{0, S_T - X\}$ , and the current value of a call option is  $C = \max\{0, S - X\}$ . Now if  $C_T > 0$  it follows that  $C_T > 0$ ; if the terminal payoff is positive the call price today must be positive. From the expression for the payoff of the call option we know that:

$$C_T \geq S_T - X \quad (1)$$

This implies that

$$C \geq S - X/R^f, \quad (2)$$

where  $\equiv 1 + r^f$ , where  $r^f$  is the risk-free rate of return, and  $X/R^f$  is the current price of the payoff  $X$  (the present value of the strike price at termination). Expression (1) says that the terminal call payoff is at least as great as the terminal stock price minus the strike price. Expression (2) says that the call price today must be greater than the current value of the stock price less the present value of the strike price. But  $R^f > 1$ , so (2) implies that  $C > S - X$ , which is the gain from exercising the option today. Hence, the value of the call is greater than the current benefit from exercising the option. The reason is that you can always delay paying the strike price, which lowers the cost of exercising it. Alternatively, early exercise of the option wipes out the option value which is positive. Another way to think about this is to note that you would have to pay a high price to buy an option today that was already in the money. That is a good deal. So don't give it up now. This result is rather interesting. It is also important. An American call option can be exercised at any date up to the terminal date. A European call option can only be exercised on the terminal date. But this result implies that we can always focus on European call options to value American options, which is nice, because the former are easier to analyze.

(c) How does the price you are willing to pay for this option change if the maturity was 180 days? Explain.

brief answer The option is worth more if the maturity increases. Greater possibility of large gains.

- (d) *If you expect that the franc is likely to be more volatile than most market participants believe how does this affect your willingness to pay for this option? Explain.*

brief answer If I expect more volatility than implied by the market, the option is underpriced, so I should buy it. Volatility increases my willingness to pay since having the option to strike is more valuable.