

**Midterm Exam II: 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. Cheating in this exam will result in failure of the course*

**Part I: Multiple Choice (36%) circle the correct answer**

1. If the US interest rate is 4% per year and the UK interest rate is 9% per year, which of the following is true:
  - (a) The dollar will depreciate 5% in one year.
  - (b) The pound will appreciate 9% in one year.
  - (c) *The pound will depreciate 5% in one year.*
  - (d) The dollar will appreciate 9% in one year.
  
2. In equilibrium, if both uncovered and covered interest parity holds, what condition should exist?
  - (a) World interest rates will be equal.
  - (b) Rates of inflation will be equalize.
  - (c) *The forward rate will equal the expected spot rate.*
  - (d) The forward rate will decrease as the spot rate rises.
  
3. Country A is experiencing productivity growth. When compared to other countries with lower productivity growth, we expect to see:
  - (a) wages and incomes falling in country A and its exchange rate appreciating.
  - (b) *wages and incomes rising in country A and its exchange rate appreciating.*
  - (c) wages and incomes falling in country A and its exchange rate depreciating.
  - (d) wages and incomes rising in country A and its exchange rate depreciating.
  
4. Current account adjustment requires a larger change in the real exchange rate if:
  - (a) *production in the economy is biased towards non-traded goods.*
  - (b) production in the economy is biased towards traded goods.
  - (c) households are indifferent between traded goods and non-traded goods.
  - (d) the economy is very open.

5. If Macrodonia has a fixed exchange rate, then an unexpected rise in the demand for its exports will:
- (a) the Central Bank's holdings of international reserves to fall.
  - (b) *the domestic money supply to rise.*
  - (c) the domestic money supply to fall.
  - (d) domestic interest rates to fall.
6. If Macrodonia has a fixed exchange rate and the Central Bank (CB) engages in sterilization, then:
- (a) if Macrodonia loses competitiveness the CB will sell domestic securities.
  - (b) if Macrodonia becomes more competitive the CB will buy domestic securities.
  - (c) *if Macrodonia becomes more competitive the CB will sell domestic securities.*
  - (d) the money supply will rise whenever the CB increases its holdings of international reserves.
7. If a currency peg is unsustainable, and if investors have rational expectations, then:
- (a) the exchange rate will jump when reserves run out.
  - (b) the period when the exchange rate will collapse is indeterminate.
  - (c) *the exchange rate regime will collapse at the first date when it is feasible to attack the currency.*
  - (d) the exchange rate will jump as soon as investor realize that the peg is unsustainable.
8. As the expected future spot rate moves closer to the spot rate, uncovered interest parity indicates that:
- (a) interest rates should remain constant.
  - (b) *interest rates should converge.*
  - (c) interest rates should diverge.
  - (d) it depends on whether the expected future spot rate is higher or lower than the spot rate.
9. There can be an opportunity for covered interest arbitrage if:
- (a) the interest rate is low and the exchange rate is high.
  - (b) *the forward/spot rate difference is either larger or smaller in percentage terms than the difference in the interest rates on the two currencies.*
  - (c) there is a time lag on the settlement of the transactions.
  - (d) the interest rate is high and the exchange rate is low.

## Part II: Short Answer (12% each)

1. Let  $\pi_{US}^e$  be expected inflation in the US, and  $\pi_E^e$  be expected inflation in Euroland. Suppose that purchasing power parity holds.

- (a) If  $\pi_E^e$  rises relative to  $\pi_{US}^e$  what happens to the expected depreciation of the currency,  $\delta \equiv \frac{e_{t+1}^e - e_t}{e_t}$  (where  $e_t$  is the number of dollars per euro at time  $t$ )? What happens to the nominal interest differential?

**brief answer** *Given PPP,  $e$  depends only on price levels, so if inflation is higher in Euroland  $e$  will fall so  $\delta$  falls. Since  $i - i^* = \delta$ , this means the differential falls.*

- (b) What does this imply about the real interest differential,  $r_{US} - r_E$ ? What is the real interest differential equal to in this case?

**brief answer** *Given PPP real interest rates are equalized across countries.*

- (c) How does your answer to part (b) change if purchasing power parity does not hold? Explain.

**brief answer** *If PPP does not hold then real interest differentials are not equalized because the two countries consume different baskets of goods.*

2. Germany and China produce 2 goods: cell phones, the traded good, denoted by  $T$ ; and haircuts, the non-traded good, denoted by  $N$ . Each good is produced in competitive markets with labor as the sole input. Workers are paid their marginal revenue product. Cell phones have no trade costs while haircuts have prohibitively high trade costs. The hourly wage rate in Germany is  $w$  euros; that in China is  $w^*$  yuan. Denote the exchange rate by  $e$  (euros per yuan). Suppose that in one hour a German worker can produce  $q$  cell phones while in China a worker produces  $q^*$  cell phones. In both countries a worker can produce one haircut per hour. Suppose the price of a cell phone is one euro. Let  $q = 30$  and  $q^* = 10$ .

- (a) If  $e = 0.5$  what will be the yuan price of cell phones?

**brief answer** *A cell phone will cost 2 yuan, since the cell phone is tradeable and has the same price in all countries. Thus,  $P_T^* = \frac{1}{e}P_T$ , or  $2 = \frac{1}{.5}(1)$ .*

- (b) What will the hourly wage in Germany be? What will the hourly wage (in yuan) in China be?

**brief answer** *The marginal product of labor in the traded goods sector in Germany is  $q = 30$ , so  $w = 30$  euros. The marginal product of labor in traded goods in China is  $q^*=10$ , so  $w^* = 20$  yuan (or 10 euros).*

- (c) What will the price of haircuts be in each country?

**brief answer** *The marginal product of labor in the traded goods sector in Germany is  $q = 30$ , so  $w = 30$  euros. The marginal product of labor in traded goods in China is  $q^*=10$ , so  $w^* = 20$  yuan (or 10 euros).*

- (d) Suppose Chinese labor productivity in cell phones doubles. What will happen to the price of haircuts in China? What will happen to the real exchange rate between Germany and China? Explain.

**brief answer** *The price of haircuts will double (to 40 yuan = 20 euro) since wages will double when productivity rises. Hence, the price level of Chinese goods rises relative to Germany so its real exchange rate will fall (recall  $Q = \frac{eP^*}{P}$ ). The rise in productivity makes Chinese wages rise and non-traded goods prices must rise in China relative to Germany. Since nothing changes in Germany goods are more expensive.*

## Part Three: Problem (40%)

1. Suppose one tests uncovered interest parity by estimating a regression such as

$$e_{t+1} - e_t = \alpha + \beta(F_t - e_t) + \gamma X_t + \varepsilon_t \quad (1)$$

where  $e_t$  is the spot exchange rate at time  $t$ ,  $F_t$  is the forward exchange rate at  $t$ ,  $X_t$  is any other potentially useful information known at time  $t$ , and  $\varepsilon_t$  is a random error.

- (a) If agents form their expectations rationally and uncovered interest parity holds, what would we expect to find in the data (i.e., what values should we find for  $\alpha, \beta$ , and  $\gamma$ )? Explain.

**brief answer** *If UIP holds then forward rates should be unbiased predictor of future spot rates. So we should find  $\alpha = \gamma = 0$ , and  $\beta = 1$ . Rational expectations means that we may make mistakes but they should be unbiased. All useful past information goes into determination of  $F$ . Covered interest parity implies that the forward rate is only higher than the spot rate when domestic interest rates exceed foreign interest rates. Uncovered interest parity implies that expected future spot rates exceed the current spot rate only when domestic interest rates exceed foreign interest rates. If  $i^*$  rises, for example, both  $F_t$  and the expected value of  $e_{t+1}$  should rise by the same amount. So  $\beta = 1$ , and nothing else in equation (1) should matter.*

- (b) Do empirical tests confirm our predictions (regarding  $\alpha, \beta, \gamma$ )? Explain.

**brief answer** *Typically not. They typically find that  $\gamma, \alpha \neq 0$ , and most importantly that  $\beta < 1$  and often  $\beta < 0$ . This is the forward discount puzzle. The forward rates under-predicts changes in the spot rate, and if  $\beta < 0$  it gets the sign of the change wrong!*

- (c) Could the typical estimated values of  $\beta$  be explained by a risk premium?

**brief answer** *Yes. If agents are risk averse then arbitrage would lead to  $1 + i = \frac{\hat{e}_{t+1}}{e_t}(1 + i^*) + \rho_t$ , where  $\rho_t$  is the risk premium. Thus we have  $f_t = \delta_t + \rho_t$ . Hence, if  $\rho_t > 0$  the forward rate could over-predict changes in the spot rate. Indeed, if  $\rho$  is large enough  $\beta < 0$  is possible. The basic idea is that people are unwilling to bear currency risk, they demand a premium to do so. Hence, they will not arbitrage away all interest differential. But covered transactions do not bear currency risk.*

- (d) Suppose there is no risk premium. Can we make money using the estimates of equation (1)? Explain what we should do.

**brief answer** *If there is no risk premium, then there is some inefficiency so we should be able to make money. Engage in the carry trade. Suppose  $i > i^*$ . If UIP holds, then the higher domestic yields just compensates for future capital losses holding dollars. But suppose instead that  $\beta < 0$  and there is no risk premium. Then if we borrow in yen at  $i^*$  and earn dollars at  $i$  not only do we earn a positive interest differential, but the yen is supposed to depreciate against the dollar! So we just borrow in the low interest rate country and invest in the high interest rate country. Again, note that if interest parity held there would be no gain here. But with  $\beta < 0$  there is no currency risk being offset by the interest differential.*

2. Microdonia is a small open economy that pegs its exchange rate to the dollar. Most of Microdonia's trade is with Europe, however. If the dollar depreciates against the euro what happens to the demand for foreign exchange in Microdonia?

**brief answer** *Microdonia's currency will depreciate against the euro as well.*

- (a) If Microdonia does not sterilize, what will happen to the money supply in Microdonia? How would Microdonia sterilize in this case? What would the Central Bank do?

**brief answer** *The money supply in Microdonia will rise as the CB accumulates international reserves. To sterilize they would need to sell DS to soak up the excess money.*

- (b) Suppose instead that the dollar was stable, but that investors believed that Microdonia's peg was not credible. What would happen to the money supply in Microdonia if the Central Bank maintained the peg? Explain. Why might this lead to a currency crisis in Microdonia?

**brief answer** *If the peg is not credible then people will expect currency depreciation, or  $\delta$  rising. This means interest rates will rise in Microdonia. Capital will flow out of the country, that is why they need to raise interest rates,  $i = i^* + \delta$ , to keep capital from flowing out.*