Midterm Exam I: Answer Sheet

1. **(20%)** Suppose that I have a short position in yen and I wish to hedge my currency risk over the next three months. Carefully explain how this risk can be hedged using the futures market and the currency options market, respectively. What are the key advantages and disadvantages of these two types of hedging strategies? Explain. Suppose that uncertainty about the future value of the yen suddenly increases (for example, the Japanese Minister of Finance is unexpectedly replaced). How does this event affect my decision between futures and options? How does this event affect the value of a currency option? Explain.

    (a) brief answer A short position in the yen means that I must deliver yen I do not have three months hence. For example, I could be building a factory in Tokyo in three months. Because I am short in yen I will lose if the yen appreciates but gain if it depreciates. I can purchase yen forward to eliminate currency risk. If the spot price today is 110 yen per dollar, and the forward price is 111, I could purchase the yen now. Then in three months I will have 111 yen for each dollar. There is no currency risk (only counterparty risk, but that is minimal). Notice, however, that if the yen depreciated in the interval – say to 115 – then by purchasing the forward (or futures) contract I have locked in the future price. I do not gain when it becomes cheaper to buy yen. If I had purchased a call option on the yen, on the other hand, I could have insured myself against appreciation without locking myself out of the gains from depreciation. Suppose that I purchase a call option with a strike price of 111. This allows me to purchase yen at 111, and if the yen appreciates the option is in the money. The return on this hedge is given in figure 1 (notice that the strike price of 111 is equal to .0090 dollars per yen). The option costs money so when the yen depreciates and I do not exercise it the value of my combined position is below the unhedged return. But when the yen appreciates I execute the option and my large potential losses are eliminated.

2. (a) more If uncertainty about the yen increases the value of the option rises. An increase in volatility means that the likelihood of large gains and large losses increase. But the option caps the losses, so the expected value of the option rises (in the picture it is as if the scale of the horizontal axis expands). Because the option is more valuable its price will rise. One could argue that increased uncertainty may favor the certain hedge, but this need not be true. Notice that an option allows me to walk away from the contract. I may not want to build the factory in three months. The futures contract means I actually purchase the yen.

2. **(25%)** Consider the two-country model of interest-rate determination with savings and investment. Suppose that at the initial world interest rate the home country has a current account
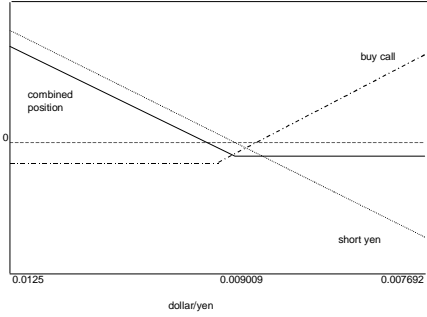
Figure 1: Using a Call Option to Hedge a Short Yen

surplus. Draw the savings-investment diagram and the equilibrium world interest rate for both countries.
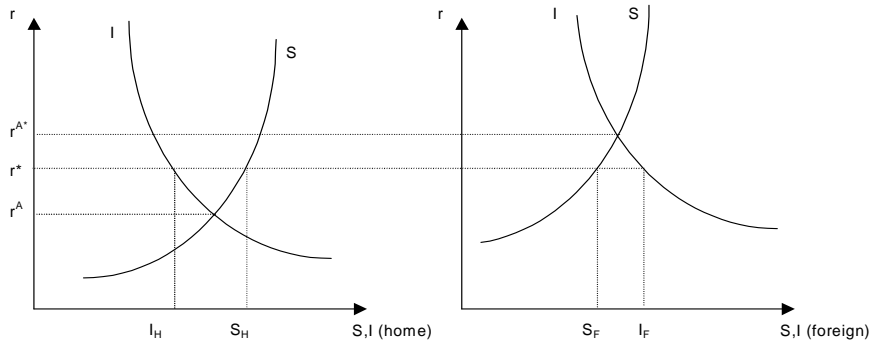

Figure 2: Global Equilibrium with Investment

3. (a) Suppose that preferences in the foreign country change so that savings is greater at every value of the interest rate. Show (using graphs wherever possible) what happens to the current account balance in the home and foreign country. What happens to the equilibrium world interest rate?

   brief answer The savings function in the foreign country shifts to the right. At the initial world interest rate the current account deficit in the foreign country has decreased.Since the current account has not changed in the home country, this means that the world current account is now in surplus. The price of current consumption must decrease, so the world interest must fall. This reduces the current account surplus in the home country. In equilibrium, the current account deficit in the foreign country is lower than before, and the current account surplus in the home country is also lower than initially, and the equilibrium world interest rate is lower.

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(b) Suppose instead that a war broke out involving the foreign country, but that the home economy was neutral. Show what happens to the current account balance in the home and foreign country. What happens to the equilibrium world interest rate?

brief answer Now the savings function in the foreign country shifts to the left. This increases their current account deficit. The world interest rate must rise. The rise in the world interest rate will increase the current account surplus in the home country. Savings will rise relative to investment.

(c) Suppose that the foreign country was not allowed to trade with the rest of the world. Show that in this case the opportunity cost of going to war is greater for the foreign country. Explain.

brief answer In a closed economy savings and investment must be equal. The increased war expenditures must be financed out of lower consumption or lower investment, or some combination of the two. The interest rate in the closed economy must increase more than in the open economy. Hence, greater adjustment in the current period must take place. The price of future consumption falling, current consumption must go down.

3. (30%) Use the asset approach to exchange rate determination to explain what happens to the exchange rate, both at impact and in the long run, in the following circumstances. Use appropriate graphs wherever possible:

(a) A permanent decrease in the nominal money supply in the US.

brief answer Consider figure 3. The decrease in the money supply means that in the long run the price level will decrease and the exchange rate will depreciate (the dollar will become more valuable). So if the initial equilibrium is at e_0, P_0, the new long-run equilibrium is at $\bar{e}, P_1$. But in the short run the price level is more rigid than the exchange rate, so the latter overshoots all the way to e_1. This follows because with tighter money the return on dollars has risen above that of euros. Investors dump euros and buy dollars until the euro has depreciated enough so that people expect appreciation of the euro (at e_1). Then the expected capital gain on the euro compensates for the lower interest rate.

4.   b. A permanent decrease in foreign interest rates.

brief answer I will accept two answers, though the latter is more complete. The first answer might be to say that the euro jumps down immediately from e_0 to e_1 as in figure 4, and this is the whole story. It is cause by the fall in the expected return on the euro. The exchange rate depreciates, end of story.

But this is not really the full answer (though I will accept it) because the question said a permanent decrease in foreign interest rates. We know that in long-run equilibrium the exchange rate is at its long-run level, so $\delta = 0$. Hence, $i = i^*$. Thus, if foreign interest rates have fallen, in the long run US interest rates must fall too. If the money stock and real output are given this means that the price level must fall to clear the money market, since $\frac{M}{P} = l(y, i^* + \delta)$. The dynamics are exactly as in figure 3. One way to think about this is that since we imposed purchasing power parity, $e = \frac{P}{P^*}$, and since the exchange rate depreciated, the US price level must fall if foreign prices are given.
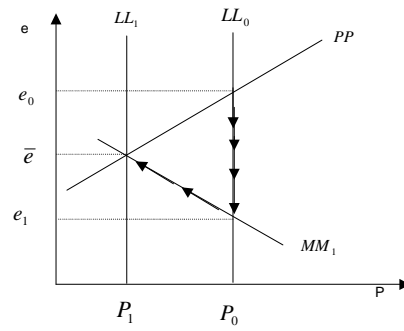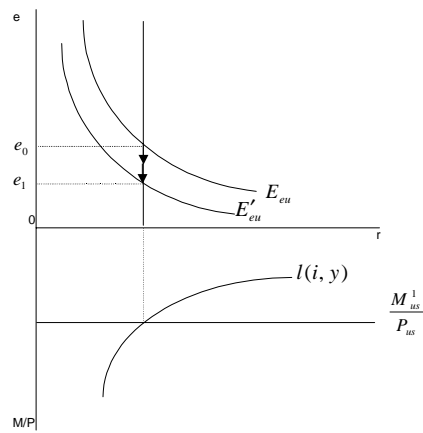
Figure 3: Permanent Decrease in the Money Supply

Figure 4: Fall in Euro Interest Rates

5.   c. A permanent increase in the foreign price level.

> brief answer An increase in the foreign price level does not affect US money demand
> or money supply. But the exchange rate must depreciate. The PP curve shifts down
> because $e = \frac{P}{P*}$, so at every level of P there is a lower exchange rate. We have figure
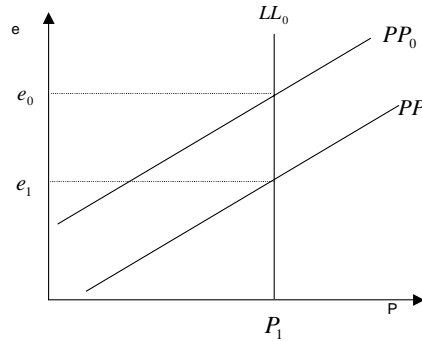> 5, where we move from e_0 to e_1.

Figure 5: Fall in the Foreign Price Level

(a) A permanent increase in US income.

> brief answer Consider first the case where the increase in income occurs immediately.
> A permanent increase in US income raises real money demand. With a given money
> supply the price level must fall to keep the money market in equilibrium, if in the
> long run US interest rates are equal to foreign interest rates. So we know that LL
> must shift to the left. Of course it takes a while for the price level to decrease
> so in the short run the exchange rate must overshoot. We could draw a picture
> exactly resembling figure 3, and tell the same story. I would also give credit for
> the less complete answer that noted the rise in real income must lead to increased
> US interest rates and an immediate decrease in the exchange rate. Perhaps most
> interesting, however, is to consider what happens if it takes time for income to rise.
> Then the immediate impact on the exchange rate will be larger than the long run
> equilibrium value. We get overshooting. The dynamics could resemble figure ??

4. (25%) During the last half of the 1990's the US current account deficit has been relatively
large. Why does the size of the current account balance matter? Explain. Several explanations
for these large deficits have been offered. Carefully explain how the following factors could
lead to large US current account deficits:

> brief answer It is probably useful for this question to recall that the current account can be
> defined as:
> $$CA = (Y + iNFA) - C - I - G \qquad (1)$$
> where Y is national income, C is consumption, I, is investment, and G is government
> spending.

(a) a decrease in US private savings

brief answer A decrease in private savings, if not offset by an increase in public savings would lead to a rise in the current account deficit, as it would increase the gap between investment and savings. The decrease in savings means more domestic spending, and at given levels of output requires more resources from abroad. From 1 a decrease in savings is a rise in consumption, so CA must fall.

(b) an increase in uncertainty in the rest of the world

brief answer Increased uncertainty abroad could lead to investment in the US as a "safe haven." A financial crisis or other uncertainty may cause investors to want to hold safer assets, e.g., T-Bills. Such inflows of investment leads to a decrease in net foreign assets, and since the current account balance is just the change in net foreign assets it must lead to a worsening current account. Another way to say it is that the increased uncertainty causes the rest of the world to want to lend more to the US; so we will borrow more from the rest of the world.

(c) the "new economy" created by the computer revolution and the internet.

brief answer Technological changes like the computer revolution and the internet cause investment demand to increase. At given savings rates this causes the current account balance to worsen. The increase in future incomes associated with the productivity improvement causes us to borrow against future income. From 1 an increase in I directly results in a decrease in CA.