Name in Block Letters: ____________________________

Soc. Sec. No.   _____ _____ - _____ - _____ _____

Class:   TTH 9:00, TTH 10:30, TTH 1:30 (circle one)

The Wharton School
International Finance
Professor Urban Jermann
Exam II, November 25, 1997

Answer key

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.
PLEASE DO NOT TURN THE PAGE UNTIL THE EXAM BEGINS.

1. When the examination begins check immediately to make sure that you have all 8 pages. The total number of points you can get is 120.

2. Print your name in block letters at the top of every page immediately when the exam begins. The exam pages will be separated after the exam, and it is important to have your name on every page.

3. Write your answers in ink. I will not consider any exam written in pencil for regrading.

4. You will have 90 minutes to complete this examination. When time is called at the end of the examination, you must stop writing immediately. Heavy penalties will be assessed against students who are observed writing after time is called.
Short Questions: Answer in the space provided after each question

A. (6 points): What is the advantage of a range forward or cylinder option (1) relative to getting a forward contract, and (2) relative to just buying options?

1) can have some upside potential
2) is cheaper than just buying an option

B. (6 points): Cite 2 reasons why the value of an outstanding cross-currency swap is likely to be more volatile than that of an interest rate swap with the same notional amount?

1) Depends on (usually volatile) exchange rate
2) There is a final principal

C. (6 points): Explain how regression results tell us that the forward exchange rate is neither a good nor an unbiased forecaster of the future spot rate.

In regressions such as:

\[(S_{t+1} - S_t)/S_t = a + b (F_{t+1} - S_t)/S_t + e_{t+1}\]

R2s are low- that is-these regressions do not explain much of the changes in the exchange rate. Moreover, b is not close to 1--as it should be for the forward to be an unbiased predictor.
D. (3 points): True/False only: "The delta of a currency call option is positive, the delta of a currency put option is negative"
   True

E. (3 points): True/False only: "The intrinsic value of a European style call is always positive"
   False/True

F. (3 points): True/False only: "If the foreign currency is at a forward discount, then European style at-the-money calls are worth more than the corresponding at-the-money puts"
   False

G. (3 points): True/False only: "Bid-ask spreads for cross-currency swaps are usually smaller than for long-dated forwards of the same maturity"
   True

H. (3 points): True/False only: "In terms of notional amounts, the quantity of outstanding cross-currency swaps is much larger than that of interest rate swaps"
   False
Question 1 (20 points):

An American company expects to make a payment of JPY 800 million in 90 days. The company wants to lock in a maximum cost in USD. The bank quotes the premium for the corresponding European at-the-forward options at 1.29 US-cent per 100 JPY. 90-day interest rates are 5% in USD, 2% in JPY; these are per annum rates, with 360 days a year convention. The 90-day forward rate is at JPY/USD 110.

A. (6 points) What type of option should the company buy, and how much will the company pay up-front for the premium?

Buy call:

Premium: \((800,000,000/100) \times 1.29/100 = \text{USD} \ 103,200\)

B. (6 points) What is the maximum USD amount, including the option premium, the company will end up paying for the yen?

\((1/110) \times 800,000,000 + 103,200 \times (1+0.05/4) = \text{USD} \ 7,377,217.\)

C. (8 points) The company has heard about the possibility of a zero-cost option strategy. In this case, the option premium is financed by selling other options for a greater amount than what is needed for locking in the above maximum cost. Explain how to implement such a strategy and what its advantages and risks are relative to a normal forward hedge.

Sell more puts than buy calls

Advantage--if JPY not too low, lock in cost at lower rate than forward

Risk--if JPY depreciates a lot, end up paying more
Question 2 (17 points):
A cylinder option on the purchase of Australian dollars, AUD, is a contract defined as follows:
• If $S_T > \text{USD/AUD } 0.75$, you buy AUD at USD/AUD 0.75, the ceiling
• If $S_T < \text{USD/AUD } 0.70$, you buy AUD at USD/AUD 0.70, the floor
• If USD/AUD 0.70 < $S_T$ < USD/AUD 0.75, you buy at $S_T$.

A. (10 points) Show the payoff of the contract graphically.

B. (7 points) Show graphically the value of a hedged debt with such a contract.
Question 3 (20 points)
A. (14 points) A French company has an outstanding fixed-for-fixed FRF/DEM currency swap for FRF 20 million. The swap is based on an initial spot rate of FRF/DEM 3.35, and initial swap rates (annual payment) of 5.75% (FRF) and 5.5% (DEM). The swap has now 2 more years to go, and the current rates are at FRF/DEM 3.25, 5.4% (FRF, 2 years swap) and 5.4% (DEM, 2 year swap). What is the FRF market value of the swap for the French company if it receives the FRF payments?

\[
\text{FRF-leg: } \left\{ \frac{0.0575}{1.054} + \frac{1.0575}{1.054^2} \right\}20m = \text{FRF 20.1294}
\]

\[
\text{DEM-leg: } \left\{ \frac{0.055}{1.054} + \frac{1.055}{1.054^2} \right\}20m/3.35 = \text{DEM 5.9812}
\]

\[
PV_{\text{FRF}} = 20.1294 - 3.25 \times 5.9812 = 20.1294 - 19.4389 = 0.6905 \rightarrow \text{FRF 690,500}
\]

B. (6 points) Explain how changes in each of the three factors, the FRF/DEM rate and the 2 swap rates, have contributed individually to your result in A.

FRF/DEM: DEM depreciate, DEM leg worth less, swap worth more

FRF-swap-rate: gone down FRF leg worth more, swap worth more

DEM-swap-rate: gone down DEM leg worth more, swap worth less
**Question 4 (15 points)**

A. (9 points) Your American company borrows USD 100 million at 7 percent for seven years, interest payments are annual. You swap the loan into DEM at the spot rate of DEM/USD 1.70, the seven-year swap rates are 6.5% (USD) and 5.75 (DEM). What are the payments on the loan, on the swap, and on the combination of them? Use the following table, indicate payments to be made by using brackets such as \( \langle \ldots \rangle \).

<table>
<thead>
<tr>
<th></th>
<th>USD-loan</th>
<th>Swap</th>
<th>USD-leg</th>
<th>combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal, at t</td>
<td>USD 100m</td>
<td>DEM 170m</td>
<td>\langle USD 100m\rangle</td>
<td>DEM 170m</td>
</tr>
<tr>
<td>Interest</td>
<td>\langle USD 7\rangle</td>
<td>\langle DEM 9.775m\rangle</td>
<td>USD 6.5m</td>
<td>\langle DEM 9.775\rangle</td>
</tr>
<tr>
<td>Principal, at T</td>
<td>\langle USD 100m\rangle</td>
<td>\langle DEM 170m\rangle</td>
<td>USD 100m</td>
<td>\langle DEM 170m\rangle</td>
</tr>
</tbody>
</table>

B. (6 points) Assume you can borrow DEM at 6.75 percent, would the swap make sense?

Yes, with the swap pay DEM 5.75% plus USD 0.5, this seems preferable to 6.75% in DEM (that is, a USD 0.5% spread is preferable to a 1% spread in DEM)
Question 5 (15 points)

Suppose we live in a 2-country world, where people only produce and consume wine and cheese. Country A uses currency FXA and country B uses FXB. Prices are expressed in local currency.

<table>
<thead>
<tr>
<th></th>
<th>Country A</th>
<th>Country B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Price per unit of good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amount of units of goods in average consumption bundle</td>
<td></td>
</tr>
<tr>
<td>Cheese (pound)</td>
<td>3 FXA 365</td>
<td>3.6 FXB 385</td>
</tr>
<tr>
<td>Wine (gallon)</td>
<td>10 FXA 70</td>
<td>12 FXB 60</td>
</tr>
</tbody>
</table>

1. (5 points) For what exchange rate would commodity price parity (law of one price) hold for both goods?

\[
\text{3.6 FXB / 3 FXA = 1.2 FXR/FXA} \quad \text{or} \quad \text{(1/1.2 FXA/FXB)}
\]

\[
\text{1.2/FX} = 1.2 \text{ FXB/FXA} \quad \text{or} \quad \text{(1/1.2 FXA/FXB)}
\]

2. (5 points) Assuming the spot exchange is at 1.3 FXB/FXA which of the two currencies is overvalued according to PPP?

At 1.3 FXB/FXA the FXA is overvalued relative to the PPP value of 1.2 FXB/FXA

3. (5 points) Assuming that the price of cheese goes up by 10% in both countries in local currency, the price of wine goes up by 5% in both countries in local currency, and the exchange rate remains unchanged. Does relative PPP hold? explain

Relative PPP will not hold, because consumers in the two countries have different consumption bundles