Chapter 5. International Parity Conditions: Interest Rate Parity and Fisher Parities

1. Suppose the US and UK three-month interest rates are respectively 6% and 8% per annum and that the spot rate is \$1.55/£.

   a. Calculate the forward premium (or discount) on the £ expressed on a per annum basis.

   b. What value of the three-month forward rate establishes Interest Rate Parity?

   SOLUTIONS:

   a. Forward Premium = $(i_{\$}/4 - i_{£}/4)/(1+i_{£}/4)$ = (0.06/4 - 0.08/4) / (1 + 0.08/4) = -0.004902; which implies -1.96% per annum. £ is at a forward discount.

   b. $(F-S)/S = (i_{\$}/4 - i_{£}/4)/(1+i_{£}/4)$; which implies $F = S + S * (i_{\$}/4 - i_{£}/4)/(1+i_{£}/4)$; F = \$1.55/£ + \$1.55/£ * -0.004902 = \$1.542402/£.

3. Assume that the Citibank trading room is dealing on the following quotations

   Spot Sterling = \$1.5000
   Euro-Sterling interest rate (6-months) = 11.00% p.a.
   Euro-\$ interest rate (6-months) = 6.00% p.a.

   and that Barclays Bank is quoting Forward Sterling (6-months) at \$1.4550.

   a. Describe the transactions you would make to earn risk-free covered interest arbitrage profits?

   b. How much profit would you expect to make?

   SOLUTIONS:

   The implied, or synthetic, forward rate that Citibank is quoting is

   $F_{Citi} = S\ (1 + i/2) / (1 + i^{*}/2)$

   $= \$1.50 * 1.03 / 1.055 = \$1.4645 / £$

   Since $F_{Barclays}$ = \$1.4550 / £, it follows that forward contracts at Barclays are cheap and synthetic forward at Citibank are dear.

a. The arbitrager should BUY forwards at Barclays and SELL synthetic forwards (i.e. borrow £, sell £ spot, and lend $) at Citibank to earn a profit.

b. The profit would be $0.0095/£ or about 0.63% on capital.

4. The following data were taken from the July 28, 1994 issue of the Currency and Bond Market Trends by Merrill Lynch:

	JAPAN	BRITAIN	U.S.
Spot exchange rates:	98.75 ¥/$	$1.53/£	----
5-year bonds:	3.73%	7.94%	6.88%
10-year bonds:	4.34	8.24	7.24
20-year bonds:	4.70	8.26	7.40

Compute the break-even exchange rate for investors weighing the choice between $-bonds and Yen-bonds, and between $-bonds and Pound sterling bonds for each of the three maturities. (Note: Assume that interest is paid twice yearly.)

SOLUTIONS:

A "break-even" exchange rate is the exchange rate that would make a risk-neutral investor indifferent between the US$ bond and the foreign currency denominated bond. In other words, it is the exchange rate that makes the Fisher International effect (i.e. uncovered interest parity) hold:

$$E(S_{t+n}) = S_t \; [(1+i/2) \;/\; (1+i^*/2)]^{2n}$$

where n = number of years to maturity of the bond.

$E(S_{t+n})$	¥/$	$/£
n = 5 years	84.70	1.4538
n = 10 years	74.50	1.3896
n = 20 years	58.47	1.2966

The point of this question is first, to get you accustomed to working with prices in $ per foreign currency and foreign currency per $. The second point is the shock value of seeing what a "small" interest differential of 1, 2, or 3% implies about exchange rates when compounded for 5, 10 or 20 years. As you can see, the impact is considerable.

5. In 1986, The Seagram Company Ltd. (Canada) issued Swiss franc bonds (SFr 250,000,000) due September 30, 2085 with a 6% coupon. Assume that a similar bond denominated in $ would have required a 9% coupon and that the spot rate on issue day was $0.50/SFr.

   a. Compute the break-even exchange rate for the redemption of the Seagram's bond at maturity.

   b. Discuss why Seagram's may have issued this bond rather than a US$ denominated bond.

SOLUTIONS:

   a. This question is really identical to #4, except that the maturity of the instrument is even longer. With annual coupons, the calculation is:

   $E(S_{t+99})$ = \$0.50/SFr $[(1+.09) / (1+.06)]^{99}$ = \$7.92/SFr

   With semi-annual coupons, the calculation would be:

   $E(S_{t+99})$ = \$0.50/SFr $[(1+.09/2) / (1+.06/2)]^{198}$ = \$8.75/SFr

   Again, the purpose of making the calculation is to see the power of compounding and the shock value of the number.

   b. Seagram's very likely issued the bond in order to exploit the feeling that uncovered interest parity reflects a bias: interest rates may be "too high" (relative to the actual exchange rate change) on weak currencies, and "too low" (relative to the actual exchange rate change) on strong currencies. If so, corporate treasurers should issue bonds in low interest rate currencies; and portfolio managers should invest in bonds with high interest rates. Both would be betting that the interest differential more than compensates for the exchange rate change. The Fisher International effect predicts that the interest differential will be an exact offset for the exchange rate change.

6. Suppose that the interest rates in question #5 reflect a 0.5% per annum currency risk premium for bond investors to willingly hold US$-denominated bonds.

   a. Compute the expected exchange rate on the maturity date of the bond in this case.

   b. How does the currency risk premium affect the choice by Seagram's to issue a US$ or SFr denominated bond?

SOLUTIONS:

a. With annual coupons, the calculation is:

$$E(S_{t+99}) = \$0.50/SF\ [(1+.09 - 0.005)/(1+.06)]^{99} = \$5.03/SF$$

With semi-annual coupons, the calculation would be:

$$E(S_{t+99}) = \$0.50/SFr\ [(1+.085/2)\ /(1+.06/2)]^{198} = \$5.45/SFr$$

b. According to this calculation, the market expects a stronger US$ and weaker SFr than in Question 5. This tilts the choice toward borrowing SFr, which Seagram's can repay with fewer US$ than indicated by the calculation in Question 5.