Chapter 3

Forward Markets and Transaction Exchange Risk

PROBLEMS

1. If the spot exchange rate of the yen relative to the dollar is ¥105.75, and the 90-day forward rate is ¥103.25/$, is the dollar at a forward premium or discount? Express the premium or discount as a percentage per annum for a 360-day year?

Answer:

\[
\frac{¥103.25/\$ - ¥105.75/\$}{¥105.75/\$} \times \frac{360}{90} \times 100 = -9.46\%
\]

Notice that the word “discount” implies that the forward rate is less than the spot rate.

2. Suppose today is Tuesday, January 18, 2011. If you enter into a 30-day forward contract to purchase euros, when will you pay your dollars and receive your euros? (Hints: February 18, 2011, is a Friday, and the following Monday is a holiday.)

Answer: To determine the value date of the forward contract, which is the day on which the exchange of currencies happens, one must first find the spot value date. For dollar-euro contracts, the spot value date is two business days in the future. Thus, for a spot contract on Tuesday, January 18, 2011, the exchange of currencies would take place on Thursday, January 20, 2011. The 30-day forward contract settles on the calendar day in the next month corresponding to the date of spot settlement if that is a legitimate business day. The forward contract would therefore settle on February, 20, 2011 if that is a legitimate business day, but that date is a Sunday. Furthermore, Monday, February 21, 2011, is a holiday, so the settlement of the forward contract would be on Tuesday, February 22, 2011.

3. As a foreign exchange trader for JPMorgan Chase, you have just called a trader at UBS to get quotes for the British pound for the spot, 30-day, 60-day, and 90-day forward rates. Your UBS counterpart stated, “We trade sterling at $1.7745-50, 47/44, 88/81, 125/115.” What cash flows would you pay and receive if you do a forward foreign exchange swap in which you swap into £5,000,000 at the 30-day rate and out of £5,000,000 at the 90-day rate? What must be the relationship between dollar
interest rates and pound sterling interest rates?

Answer: The fact that you are swapping into £5,000,000 at the 30-day rate forward rate means that you are paying dollars and buying pounds. You would do this transaction at the bank’s 30-day forward ask rate. To find the forward ask rate, you must realize that the 30-day forward points of 47/44 indicate the amounts that must be subtracted from the spot bid and ask quotes to get the forward rates. We know to subtract the points because the first forward point is greater than the second. Hence, the first part of the swap would be done at $1.7750/£ - $0.0044/£ = $1.7706/£. Therefore, to buy £5,000,000 you would pay $1.7706/£ \times £5,000,000 = $8,853,000

In the second leg of the swap, you would sell £5,000,000 for dollars in the 90-day forward market. Because you are selling pound for dollars, you transact at the 90-day forward bid rate of $1.7745/£ - $0.0125/£ = $1.7620/£. Therefore, you would receive $1.7620/£ \times £5,000,000 = $8,810,000

Notice that you get back fewer dollars than you paid, but you had use of £5,000,000 for 60 days. Thus, the pound must be the higher interest rate currency.

4. Consider the following spot and forward rates for the yen–euro exchange rates:

<table>
<thead>
<tr>
<th></th>
<th>Spot</th>
<th>30 days</th>
<th>60 days</th>
<th>90 days</th>
<th>180 days</th>
<th>360 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>146.30</td>
<td>145.75</td>
<td>145.15</td>
<td>144.75</td>
<td>143.37</td>
<td>137.85</td>
</tr>
</tbody>
</table>

Is the euro at a forward premium or discount? What are the magnitudes of the forward premiums or discounts when quoted in percentage per annum for a 360-day year?

Answer: The forward rates of yen per euro are lower than the spot rates. Therefore, the euro is at a discount in the forward market. The annualized forward premium or discount for the N day forward contract is

\[
\frac{F - S}{S} \times \frac{360}{N \text{ days}} = 100
\]

If the value of this calculation is negative, say -2%, we say there is a 2% discount. Therefore, the discounts are 4.51% for 30 days, 4.72% for 60 days, 4.24% for 90 days, 4.01% for 180 days, and 5.78% for 360 days.
5. As a currency trader, you see the following quotes on your computer screen:

<table>
<thead>
<tr>
<th>Exch. Rate</th>
<th>Spot</th>
<th>1-month</th>
<th>2-month</th>
<th>3-month</th>
<th>6-month</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD/EUR</td>
<td>1.0435/45</td>
<td>20/25</td>
<td>52/62</td>
<td>75/90</td>
<td>97/115</td>
</tr>
<tr>
<td>JPY/USD</td>
<td>98.75/85</td>
<td>12/10</td>
<td>20/16</td>
<td>25/19</td>
<td>45/35</td>
</tr>
<tr>
<td>USD/GBP</td>
<td>1.6623/33</td>
<td>30/35</td>
<td>62/75</td>
<td>95/110</td>
<td>120/130</td>
</tr>
</tbody>
</table>

a. What are the outright forward bid and ask quotes for the USD/EUR at the 3-month maturity?

*Answer*: The spot bid and ask quotes for USD/EUR are 1.0435/45. These quotes mean that the bank buys euros with dollars spot at $1.0435/€, and the bank sells euros for dollars at $1.0445/€. Because the forward points at the 3-month maturity are 75/90, we know that we must add the points to get the outright forward bid and ask rates. Adding the points makes the bid-ask spread in the forward market larger than the bid-ask spread in the spot market. Consequently, the forward bid rate is $1.0435/€ + $0.0075/€ = $1.0510/€, and the forward ask quote is $1.0445/€ + $0.0090/€ = $1.0535/€.

b. Suppose you want to swap out of $10,000,000 and into yen for 2 months. What are the cash flows associated with the swap?

*Answer*: When you swap out of $10,000,000 into yen in the spot market, you are selling dollars to the bank. The bank buys dollars at its low bid rate of ¥98.75/$, so you get ¥98.75/$ × $10,000,000 = ¥987,500,000

When you contract to buy the $10,000,000 back from the bank in the 2-month forward market, you must pay the bank’s ask rate of

¥98.85/$ - ¥00.16/$ = ¥98.69/$

You subtract the points because the 2-month forward quote is 20/16. Subtracting the points makes the bid-ask spread in the forward market larger than the bid-ask spread in the spot market. Hence, the amount of yen you pay is ¥98.69/$ × $10,000,000 = ¥986,900,000

c. If one of your corporate customers calls you and wants to buy pounds with dollars in 6 months, what price would you quote?

*Answer*: If the customer wants to buy pounds with dollars, the customer must pay the bank’s 6-month ask rate. The spot quotes are 1.6623/33 which means the spot ask rate is $1.6633/£. The 6-month forward points are 120/130. We add the points because the first one, 120, is less than the second, 130. Hence, the outright forward quote would be $1.6633/£ + $0.0130/£ = $1.6763/£
6. Intel is scheduled to receive a payment of ¥100,000,000 in 90 days from Sony in connection with a shipment of computer chips that Sony is purchasing from Intel. Suppose that the current exchange rate is ¥103/$, that analysts are forecasting that the dollar will weaken by 1% over the next 90 days, and that the standard deviation of 90-day forecasts of the percentage rate of depreciation of the dollar relative to the yen is 4%.

a. Provide a qualitative description of Intel’s transaction exchange risk.

Answer: Intel is a U.S. company, and it is scheduled to receive yen in the future. A weakening of the yen versus the dollar causes a given amount of yen to convert to fewer dollars in the future. This loss of value could be severe if the yen depreciates by a significant amount.

b. If Intel chooses not to hedge its transaction exchange risk, what is Intel’s expected dollar revenue?

Answer: If Intel chooses not to hedge, the expected dollar revenue is the expected dollar value of the ¥100,000,000. The expected spot rate incorporates a 1% weakening of the dollar. This means that the expected yen price of the dollar is 1% less than the current spot rate of ¥103/$ or

\[
Et[S(t+90,¥/$)] = 0.99 \times ¥103/$ = ¥101.97/$
\]

Hence, Intel expects to receive ¥100,000,000 / ¥101.97/$ = $980,681

c. If Intel does not hedge, what is the range of possible dollar revenues that incorporates 95.45% of the possibilities?

Answer: We are told that the standard deviation of the rate of depreciation of the dollar is 4%. The standard deviation of the future spot rate is therefore 4% of the current spot rate or 0.04 \times ¥103/$ = ¥4.12/$. Thus, plus or minus 2 standard deviations around the conditional expected future spot rate is

\[
¥101.97/$ + ¥8.24/$ = ¥110.21/$ \quad ¥101.97/$ - ¥8.24/$ = ¥93.73/$
\]

The range that encompasses 95.45% of possible future values for Intel’s receivable is therefore

¥100,000,000 / ¥110.21/$ = $907,359

¥100,000,000 / ¥93.73/$ = $1,066,894