

Continuing education

How Markets Price FX Forwards

By John R. Rush
Oakbridge Limited
Financial Consulting Group

Forwards have long been the workhorse of forex markets, but not everyone appreciates their pricing subtleties.

Foreign exchange markets can be divided into spot markets and forward markets respectively. Foreign exchange dealers routinely quote forward foreign exchange rates, but the means by which this is accomplished are often not accurately appreciated.

A forward pricing example

Consider the case of a Japanese car manufacturer which exports to the US and consequently has substantial foreign exchange exposures, being long dollar-denominated receivables. In particular, say a receivable of USD10 million is expected in three months and the car manufacturer's treasurer approaches the company's bank seeking a forward foreign exchange contract in order to "fix" the three-month forward exchange rate and avoid exchange rate risk.

Assuming a spot exchange rate of USD/JPY 114.50, the bank immediately quotes a three month forward of USD/JPY 113.06. How does the bank quote the three-month forward rate?

Nuts and bolts. The underlying transactions which enable the bank to quote a forward rate are as follows (see Figure 1):

(1) SPOT: sell USD10 mil at a spot rate of USD/JPY 114.50 and receive JPY 1,129.1913 mil.

(2) SWAP: what in Figure 1 appears to be a 90-day USD borrowing at 5.60% pa, taken

together with the 90 day JPY investment at 0.50% pa, is referred to as a 90-day USD/JPY "spot against forward swap."

In practice, the swap entails two distinct "legs" (both undertaken with the same counterparty), namely:

(i) at spot: buy USD10 mil and sell JPY1,129.1913 mil and

(ii) 90 days after spot: sell (or swap) USD10 mil and buy an amount of JPY to be determined by the 90-day "forward points" (or "swap points").

It is the combination of the spot transaction (undertaken by specialist spot dealers) and the swap (undertaken by the swap dealers, who deal "forwards")

UNIT/CURRENCY (spot rate)

where:

- UNIT = first quoted currency
- CURRENCY = second quoted currency (to the right of the "/")
- spot rate = a varying numerical market determined rate
- and noting that the "/" means "equal to" not "divide by."

For a dealer to then make a forward USD/JPY quote, there must be two interest rates for the particular time period. In general, the dealer will seek the interest rate on the UNIT of the quote (here, the USD interest rate) and the interest rate on the CURRENCY of the quote (here, the JPY interest rate).

The equation for forward points, POINTS, is then given by:

$$\text{POINTS} = \frac{\text{SPOT} \times (\pm \text{IUNIT} \mp \text{ICUR}) \times (\text{DAYS}/360)}{1 + [(\text{DAYS}/360) \times \text{IUNIT}]}$$

where:

- SPOT = spot exchange rate
- IUNIT = interest rate on UNIT of quote (entered as decimal)
- ICUR = interest rate on CURRENCY of quote (entered as decimal)
- DAYS = days in forward period
- and assuming a 360 day year (rather than a 365 day year).

For example, assuming the following:

- SPOT = 114.50
- IUNIT = 5.60% pa (the USD interest rate)
- ICUR = 0.50% pa (the JPY interest rate)
- DAYS = 90

then the 90 day forward USD/JPY points are:

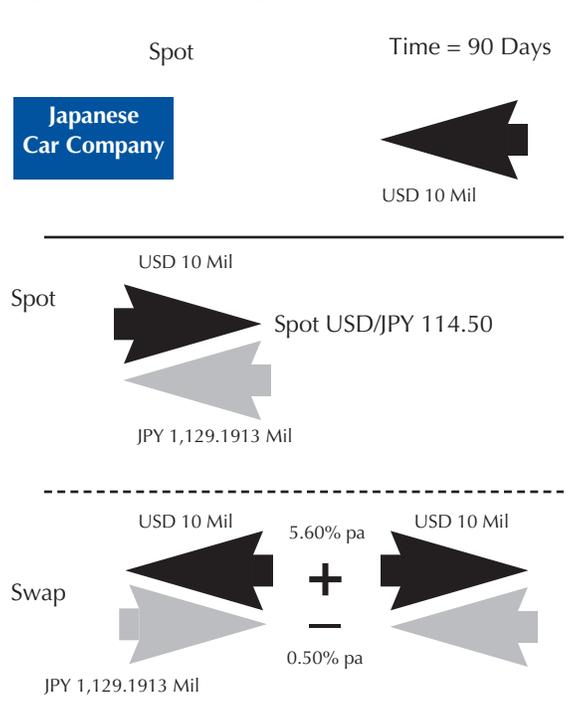
$$\begin{aligned} \text{POINTS} &= \frac{114.50 \times (\pm 0.056 \mp 0.0050) \times (90/360)}{1 + [(90/360) \times 0.056]} \\ &= 144 \text{ points} \end{aligned}$$

This is the equivalent of 1.44 JPY, after rounding the calculated number after the second decimal place and then ignoring the decimal point.

Outright rate. The calculated forward points would be deducted from the spot rate of USD/JPY 114.50, because US

continued on reverse

Figure 1: Determining a Forward FX Rate



that allows the price-making bank to determine the forward exchange rate.

Interest differential is key. Notice that the swap described above entails an interest rate differential between the USD and the JPY of: (5.60 - 0.50) = 5.10% pa. It is this interest rate differential which now needs to be translated mathematically to a precise number of "forward points" for, in this case, the 90-day forward time period. This calculation is made by initially defining an exchange rate quotation:

interest rates are higher than Japanese rates. Hence the 90-day outright forward rate would be:

$$\text{USD/JPY (114.50 - 1.44)} = \text{USD/JPY 113.06}$$

Arbitrage over expectations

What if another dealer is quoting a different number of forward points (e.g., 140 points) for the same forward date at the same time? Clearly, an arbitrage opportunity would exist. The dealer who had just formally calculated the 90-day forward points would buy USD 90 days forward at the "high" number of points (i.e., 144) deducted from the spot rate and simultaneously sell USD 90 days forward at the "low" number of points (i.e., 140) deducted from the spot rate, making a risk-free (or arbitrage) profit. In effect, the two money markets (the US and Japanese) have been arbitrated against the FX market.

Such arbitrage is why interest rate differentials have the most compelling influence on forward foreign exchange rate determination—and not expectations of future spot moves (a common misperception).

Any dealer who ever quotes a forward price which differs markedly from that dictated by the interest rate differential merely presents other dealers with a risk-free profit opportunity. This is why it would be sheer folly for a bank to quote forward prices that simply reflected its expectations of the future spot rate.

Mr. Rush is based in Sydney, Australia and reached at +61-2-9904-1600, fax +61-2-9904-1644.

Get a new perspective on your treasury management

Whether you serve a company with multiple foreign affiliates, or one with a largely domestic focus, you'll find value in our fortnightly treasury management journal.

Our topical articles are filled with:

- Unparalleled insight into treasury management/organization trends
- Practical advice and examples
- Details on software and systems
- Useful explanations of current cash and risk management techniques
- Perspective on financial products and services relevant to treasurers
- Commentary on market forces and country-level developments

International Treasurer

The Journal of Global Treasury and Financial Risk Management

January 2001 • Volume 1, Number 1 • www.intltreasurer.com

Prepared by D&D

The Year of the Euro Prep

By David D.

1997 is quickly shaping up to be a year of intense preparation for European Treasury Officers and the introduction of the Euro.

This year's economic performance data will not lead to optimism which European companies will take this year for necessary action. September is scheduled for March 1999 and the general consensus now is for a significant recession to be established in Europe. "This, 1997 is also a good year for companies preparing to accelerate or begin to convert their preparation for the year. When the impact of the Euro is felt, it may take a year or two to get the market around the process that will get them back to work in more immediate-term 1999. There are a few more months to go.

The year will

Such advance preparation is needed because D&D has completed the more business here, as well as the entire Treasury function. It has completed a number of projects, some of which are still in progress.

It is hoped that the working consensus is shared by someone at a high level in the company and that they are working together.

of the financial institutions in the Treasury Unit of Europe (AMEL). This involves being able to understand the financial data and all the technical details that have to be shared with the company. In the US and Europe, it is critical that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

Using Simulation of Cash Flows

By David D.

Simple ways to manage cash flows can help companies manage their cash flows better.

Each measurement should be part of a process—one aimed at supporting better management decisions for more consistent cash flow management. This is the concept of Cash Flow Management.

It is important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

It is also important that the company be able to share the information with the company.

For more information:

Fax contact details to +212-370-1701, phone +212-370-1298, or post them to: International Treasurer, 305 Madison Avenue, Suite 1146 New York, New York, 10165 USA

Or visit our website at <http://www.intltreasurer.com>

International Treasurer

The Journal of Global Treasury and Financial Risk Management

305 Madison Avenue • Suite 1146 • New York • NY 10165 • USA
Phone (212) 370-1298 • Fax (212) 370-1701

Yes, please start a subscription for (tick box):

One year, \$695 Two years, \$1,195 Six months, \$375 (Offers expire 12/31/97).

Name: _____

Title: _____

Company: _____

Address: _____

City: _____ State: _____

Zip/Postal: _____ Country: _____

Your satisfaction is guaranteed.

You may cancel your subscription at any time and receive a refund for the pro rata amount remaining.

Subscription Form

Please mail this completed form

or fax it to (212) 370-1701.

Or call (800) 535-2884 or (212) 370-1298

outside North America.

Please send an invoice.

Check enclosed.

Please bill: Amex Mastercard Visa

Card number _____

Expiration date ____ / ____

X _____

Signature (required on all orders)