Chapter 5

Currency Derivatives

J. Gaspar: Adapted from Jeff Madura, International Financial Management
Currency Derivatives

• Currency derivatives are financial instruments whose prices are determined by the underlying value of the currency under consideration.

• Currency derivatives therefore make sense only in a flexible/floating exchange rate system where currency values keep changing.
Chapter Objectives

- To explain how forward contracts are used in international transactions for hedging against anticipated exchange rate movements; and
- To explain how currency futures contracts and currency options contracts are used for hedging or speculation based on anticipated exchange rate movements.
A forward contract is an agreement between a firm and a commercial bank to exchange a specified amount of a currency at a specified exchange rate (called the forward rate) on a specified date in the future.

Forward contracts are sold in volumes of $1 million or more, and are not normally used by consumers or small firms.
Forward Market

• When MNCs anticipate a future need for or future receipt of a foreign currency, they can set up forward contracts to lock in the exchange rate.
• The % by which the forward rate \( (F) \) exceeds the spot rate \( (S) \) at a given point in time is called the forward premium \( (p) \).
  \[
  F = S (1 + p)
  \]
• \( F \) exhibits a discount when \( p < 0 \).

\[
F = S(1 + p)
\]
Forward Market

Example

S = $1.681/£, 90-day F = $1.677/£

annualized \( p = \frac{F - S \times 360}{S \times n} \)

\[
= \frac{1.677 - 1.681 \times 360}{1.681 \times 90} = -.95\%
\]

👋 The forward premium (discount) usually reflects the difference between the home and foreign interest rates, thus preventing **arbitrage**.
Forward Market

• A swap transaction involves a spot exchange transaction along with a corresponding forward contract that will reverse the spot transaction.

• A non-deliverable forward contract (NDF) does not result in an actual exchange of currencies on settlement date. Instead, one party makes a net payment to the other based on a market exchange rate on the day of settlement.
An NDF can effectively hedge future foreign currency payments or receipts:

<table>
<thead>
<tr>
<th>April 1</th>
<th>July 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expect need (AP) for 100M Chilean pesos. Negotiate an NDF to buy 100M Chilean pesos on Jul 1. Reference index (closing rate quoted by Chile’s central bank) = $.0020/peso.</td>
<td>Buy 100M Chilean pesos from market. Index = $.0023/peso ⇒ receive $30,000 from bank due to NDF. Index = $.0018/peso ⇒ pay $20,000 to bank.</td>
</tr>
</tbody>
</table>

Buy 100M Chilean pesos from market. Index = $.0023/peso ⇒ receive $30,000 from bank due to NDF. Index = $.0018/peso ⇒ pay $20,000 to bank.
Currency Futures Market

- **Currency futures contracts** specify a standard volume of a particular currency to be exchanged on a specific settlement date.
- They are used by MNCs to hedge their currency positions, and by speculators who hope to capitalize on their expectations of exchange rate movements.
Currency Futures Market

- The contracts can be traded by firms or individuals through brokers on the trading floor of an exchange (e.g. Chicago Mercantile Exchange), automated trading systems (e.g. GLOBEX), or the over-the-counter market.

- Brokers who fulfill orders to buy or sell futures contracts typically charge a commission.
Comparison of the Forward & Futures Markets

<table>
<thead>
<tr>
<th></th>
<th>Forward Markets</th>
<th>Futures Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract size</td>
<td>Customized</td>
<td>Standardized</td>
</tr>
<tr>
<td>Delivery date</td>
<td>Customized</td>
<td>Standardized</td>
</tr>
<tr>
<td>Participants</td>
<td>Banks, brokers, MNCs. Public speculation not encouraged.</td>
<td>Banks, brokers, MNCs. Qualified public speculation encouraged.</td>
</tr>
<tr>
<td>Security Deposit</td>
<td>Compensating bank balances or credit lines needed.</td>
<td>Small security deposit required.</td>
</tr>
<tr>
<td>Clearing operation</td>
<td>Handled by individual banks &amp; brokers.</td>
<td>Handled by exchange clearinghouse. Daily settlements to market prices.</td>
</tr>
</tbody>
</table>
Comparison of the Forward & Futures Markets

<table>
<thead>
<tr>
<th></th>
<th><strong>Forward Markets</strong></th>
<th><strong>Futures Markets</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marketplace</strong></td>
<td>Worldwide telephone network</td>
<td>Central exchange floor with worldwide communications.</td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
<td>Self-regulating</td>
<td>Commodity Futures Trading Commission, National Futures Association.</td>
</tr>
<tr>
<td><strong>Liquidation</strong></td>
<td>Mostly settled by actual delivery.</td>
<td>Mostly settled by offset.</td>
</tr>
<tr>
<td><strong>Transaction Costs</strong></td>
<td>Bank’s bid/ask spread.</td>
<td>Negotiated brokerage fees.</td>
</tr>
</tbody>
</table>
Currency Futures Market

- Because of potential arbitrage activities, the prices of currency futures are closely related to their corresponding currency forward and spot rates.
- Currency futures contracts are guaranteed by the exchange clearinghouse, which in turn minimizes its own credit risk by imposing margin requirements on those market participants who take a position.
Currency Futures Market

Speculators often sell currency futures when they anticipate the underlying currency to depreciate, and vice versa.

April 4

1. Contract to sell 500,000 pesos @ $.09/peso ($45,000) on June 17.

June 17

2. Buy 500,000 pesos @ $.08/peso ($40,000) from the spot market.

3. Sell the pesos to fulfill contract. Gain $5,000.
Currency Futures Market

MNCs may purchase currency futures to hedge their foreign currency payables, or sell currency futures to hedge their receivables.

1. Expect to receive 500,000 pesos. Contract to sell 500,000 pesos @ $.09/peso on June 17.
2. Receive 500,000 pesos as expected.
3. Sell the pesos at the locked-in rate.
Currency Futures Market

- Change in business plans can cause holders of futures contracts to close out their positions by selling similar futures contracts. Sellers may also close out their positions by purchasing similar contracts.

<table>
<thead>
<tr>
<th>January 10</th>
<th>February 15</th>
<th>March 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Contract to buy A$100,000 @ $.53/A$ ($53,000) on March 19.</td>
<td>2. Contract to sell A$100,000 @ $.50/A$ ($50,000) on March 19.</td>
<td>3. Incurs $3000 loss from offsetting positions in futures contracts.</td>
</tr>
</tbody>
</table>
Currency Options Market

- Currency options provide the right to purchase or sell currencies at specified prices. They are classified as calls or puts.
- Standardized options are traded on exchanges through brokers.
- Customized options offered by brokerage firms and commercial banks are traded in the over-the-counter market.
Currency Call Options

- A currency call option grants the holder the right to buy a specific currency at a specific price (called the exercise or strike price) within a specific period of time.

- A call option is

  - in the money if exchange rate > strike price,
  - at the money if exchange rate = strike price,
  - out of the money if exchange rate < strike price.
Currency Call Options

- Option owners can sell or exercise their options, or let their options expire.
- Call option premiums will be higher when:
  - (spot price – strike price) is larger;
  - the time to expiration date is longer; and
  - the variability of the currency is greater.
- Firms may purchase currency call options to hedge payables, project bidding, or target bidding.
Currency Call Options

• Speculators may purchase call options on a currency that they expect to appreciate.
  • Profit = selling (spot) price – option premium – buying (strike) price
  • At breakeven, profit = 0.

• They may also sell (write) call options on a currency that they expect to depreciate.
  • Profit = option premium – buying (spot) price + selling (strike) price
Currency Put Options

- A currency put option grants the holder the right to sell a specific currency at a specific price (the strike price) within a specific period of time.

- A put option is
  - **in the money** if exchange rate < strike price,
  - **at the money** if exchange rate = strike price,
  - **out of the money** if exchange rate > strike price.
Currency Put Options

• Put option premiums will be higher when:
  • (strike price – spot rate) is larger;
  • the time to expiration date is longer; and
  • the variability of the currency is greater.

• Firms may purchase currency put options to hedge future receivables.
Currency Put Options

• Speculators may purchase put options on a currency that they expect to depreciate.
  • Profit = selling (strike) price – buying price – option premium

• They may also sell (write) put options on a currency that they expect to appreciate.
  • Profit = option premium + selling price – buying (strike) price
Currency Put Options

• One possible speculative strategy for volatile currencies is to purchase both a put option and a call option at the same exercise price. This is called a straddle.

• By purchasing both options, the speculator may gain if the currency moves substantially in either direction, or if it moves in one direction followed by the other.
Efficiency of Currency Futures and Options

- If foreign exchange markets are efficient, speculation in the currency futures and options markets should not consistently generate abnormally large profits.
Contingency Graphs for Currency Options

For Buyer of £ Call Option

- Strike price = $1.50
- Premium = $.02

For Seller of £ Call Option

- Strike price = $1.50
- Premium = $.02

Net Profit per Unit

Future Spot Rate

Future Spot Rate
Contingency Graphs for Currency Options

For Buyer of £ Put Option

- Strike price = $1.50
- Premium = $0.03

For Seller of £ Put Option

- Strike price = $1.50
- Premium = $0.03

Net Profit per Unit

Future Spot Rate

Future Spot Rate
Conditional Currency Options

• A currency option may be structured such that the premium is conditioned on the actual currency movement over the period of concern.

• Suppose a conditional put option on £ has an exercise price of $1.70, and a trigger of $1.74. The premium will have to be paid only if the £’s value exceeds the trigger value.
# Conditional Currency Options

<table>
<thead>
<tr>
<th>Option Type</th>
<th>Exercise Price</th>
<th>Trigger</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>basic put</td>
<td>$1.70</td>
<td>-</td>
<td>$0.02</td>
</tr>
<tr>
<td>conditional put</td>
<td>$1.70</td>
<td>$1.74</td>
<td>$0.04</td>
</tr>
</tbody>
</table>

- **Net Amount Received**

### Graphical Representation

- **Basic Put**
- **Conditional Put**

- **Spot Rate**

<table>
<thead>
<tr>
<th>Spot Rate</th>
<th>Net Amount Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.66</td>
<td>$1.68</td>
</tr>
<tr>
<td>$1.70</td>
<td>$1.72</td>
</tr>
<tr>
<td>$1.74</td>
<td>$1.76</td>
</tr>
<tr>
<td>$1.78</td>
<td>$1.78</td>
</tr>
<tr>
<td>$1.82</td>
<td>$1.74</td>
</tr>
</tbody>
</table>
Conditional Currency Options

• Similarly, a conditional call option on £ may specify an exercise price of $1.70, and a trigger of $1.67. The premium will have to be paid only if the £’s value falls below the trigger value.

• In both cases, the payment of the premium is avoided conditionally at the cost of a higher premium.
European Currency Options

- European-style currency options are similar to American-style options except that they can only be exercised on the expiration date.
- For firms that purchase options to hedge future cash flows, this loss in flexibility is probably not an issue. Hence, if their premiums are lower, European-style currency options may be preferred.