Chapter Objective:
This chapter discusses various methods available for the management of transaction exposure facing multinational firms.

Chapter Outline:
- Forward Market Hedge
- Money Market Hedge
- Options Market Hedge
- Cross-Hedging Minor Currency Exposure
- Hedging Contingent Exposure
- Hedging Recurrent Exposure with Swap Contracts

Chapter Outline (continued):
- Hedging Through Invoice Currency
- Hedging via Lead and Lag
- Exposure Netting
- Should the Firm Hedge?
- What Risk Management Products do Firms Use?

Forward Market Hedge

- If you are going to owe foreign currency in the future, agree to buy the foreign currency now by entering into long position in a forward contract.
- If you are going to receive foreign currency in the future, agree to sell the foreign currency now by entering into short position in a forward contract.

Forward Market Hedge: an Example

You are a U.S. importer of British woolens and have just ordered next year’s inventory. Payment of £100M is due in one year.

Question: How can you fix the cash outflow in dollars?
Answer: One way is to put yourself in a position that delivers £100M in one year—a long forward contract on the pound.
Forward Market Hedge

Suppose the forward exchange rate is $1.50/£.
If he does not hedge the £100m payable, in one year his gain (loss) on the unhedged position is shown in green.

$1.50/£ Value of £1 in $ in one year

$1.20/£ $1.80/£ $30m

The importer will be better off if the pound depreciates: he still buys £100m but at an exchange rate of only $1.20/£ he saves $30 million relative to $1.50/£.

But he will be worse off if the pound appreciates.

Unhedged payable

$30m

$0

Value of £1 in $ in one year

$1.20/£ $1.50/£ $1.80/£

Long forward

$1.20/£ $1.50/£ $1.80/£

Value of £1 in $ in one year

If he agrees to buy £100 million at a price of $1.50 per pound, his gain (loss) on the forward are shown in blue.

$0

$30m

$1.20/£

– $30m

If you agree to buy £100 million at a price of $1.50 per pound, you will lose $30 million if the price of a pound is only $1.20.

If you agree to buy £100 million at a price of $1.50 per pound, you will make $30 million if the price of a pound reaches $1.80.

Money Market Hedge

This is the same idea as covered interest arbitrage.
To hedge a foreign currency payable, buy a bunch of that foreign currency today and sit on it.
Buy the present value of the foreign currency payable today.
Invest that amount at the foreign rate.
At maturity your investment will have grown enough to cover your foreign currency payable.

A U.S.–based importer of Italian bicycles
In one year owes €100,000 to an Italian supplier.
The spot exchange rate is $1.25 = €1.00.
The one-year interest rate in Italy is 4%.

Can hedge this payable by buying €96,153.85 = €100,000 / 1.04 today and investing €96,153.85 at 4% in Italy for one year.
At maturity, he will have €100,000 = €96,153.85 × (1.04)

Dollar cost today = $120,192.31 = €96,153.85 × $1.25

With this money market hedge, we have redenominated a one-year €100,000 payable into a $120,192.31 payable due today.
If the U.S. interest rate is 3% we could borrow the $120,192.31 today and owe in one year

$123,798.08 = $120,192.31 × (1.03)

$123,798.08 = $100,000 / (1 + i_d) × (1 + i_f)^T

$123,798.08 = $100,000 / (1 + 0.03) × (1 + 0.04)^1
Money Market Hedge: Step One

Suppose you want to hedge a payable in the amount of £\( y \) with a maturity of \( T \):

i. Borrow $\( x \) at \( t = 0 \) on a loan at a rate of \( i \) per year.

\[
S(\$/£) \cdot £y \cdot (1 + i)T
\]

ii. Repay the loan in \( T \) years

\[
S(\$/£) \cdot £y \cdot (1 + i)T
\]

Money Market Hedge: Step Two

ii. Exchange the borrowed $\( x \) for \( \frac{£y}{1 + i} \) at the prevailing spot rate.

Invest \( \frac{£y}{1 + i} \) at \( i \) for the maturity of the payable.

At maturity, you will owe a $\( x \) \( (1 + i)T \).

Your British investments will have grown to £\( y \).

This amount will service your payable and you will have no exposure to the pound.

Options Market Hedge

- Options provide a flexible hedge against the downside, while preserving the upside potential.
- To hedge a foreign currency payable buy calls on the currency.
  - If the currency appreciates, your call option lets you buy the currency at the exercise price of the call.
- To hedge a foreign currency receivable buy puts on the currency.
  - If the currency depreciates, your put option lets you sell the currency for the exercise price.

Options Markets Hedge

Suppose our importer buys a call option on £100m with an exercise price of $1.50 per pound.

He pays $0.05 per pound for the call.

Profit

Long call on £100m

$1.55/£

$1.50/£

Value of £ in $ in one year

$0

$1.20/£

$1.50/£

Value of £ in $ in one year

But he will be worse off if the pound appreciates.

Unhedged position is shown as -£30m in green.
**Options Markets Hedge**

**Profit**

- $25m
- $1.20/£
- $1.45/£
- $1.50/£
- $25m
- $30m

**Loss**

- $5m
- Value of £1 in $ in one year
- Unhedged payable
- Hedged payable

The payoff of the portfolio of a call and a payable is shown in red. He can still profit from decreases in the exchange rate below $1.45/£ but has a hedge against unfavorable increases in the exchange rate.

**Options Markets Hedge**

**Profit**

- If the exchange rate increases to $1.80/£ the importer makes $25 m on the call but loses $30 m on the payable for a maximum loss of $5 million.

- $25 m
- $2.05
- $2

**Loss**

- $5 m
- Value of £1 in $ in one year
- Unhedged payable
- Hedged payable

This can be thought of as an insurance premium.

**Options Markets Hedge**

**IMPORTERS** who **owe** foreign currency in the future should **BUY CALL OPTIONS.**

- If the price of the currency goes up, his call will lock in an upper limit on the dollar cost of his imports.
- If the price of the currency goes down, he will have the option to buy the foreign currency at a lower price.

**EXPORTERS** with accounts receivable denominated in foreign currency should **BUY PUT OPTIONS.**

- If the price of the currency goes down, puts will lock in a lower limit on the dollar value of his exports.
- If the price of the currency goes up, he will have the option to sell the foreign currency at a higher price.

**Hedging Exports with Put Options**

- Show the portfolio payoff of an exporter who is owed £1 million in one year.
- The current one-year forward rate is £1 = $2.
- Instead of entering into a short forward contract, he buys a put option written on £1 million with a maturity of one year and a strike price of £1 = $2.
- The cost of this option is $0.05 per pound.

**Options Market Hedge**

**Exporter buys a put option to protect the dollar value of his receivable.**

- $1,950,000
- $2
- $2.05

**The exporter who buys a put option to protect the dollar value of his receivable has essentially purchased a call.**

- $1.950,000
- $2
- $2.05
Hedging Imports with Call Options

- Show the portfolio payoff of an importer who owes £1 million in one year.
- The current one-year forward rate is £1 = $1.80; but instead of entering into a short forward contract,
- He buys a call option written on £1 million with an expiry of one year and a strike of £1 = $1.80. The cost of this option is $0.08 per pound.

Forward Market Hedge: Importer buys £1m forward.

Options Market Hedge: Importer buys call option on £1m.

Taking it to the Next Level

- Suppose our importer can absorb “small” amounts of exchange rate risk, but his competitive position will suffer with big movements in the exchange rate.
- Large dollar depreciations increase the cost of his imports.
- Large dollar appreciations increase the foreign currency cost of his competitors’ exports, costing him customers as his competitors renew their focus on the domestic market.

Our Importer Buys a Second Call Option

Our importer who buys a call to protect himself from increases in the value of the pound creates a synthetic put option on the pound.

He makes money if the pound falls in value.

The cost of this “insurance policy” is $80,000.

This position is called a straddle.
Suppose instead that our importer is willing to
risk large exchange rate changes but wants to
profit from small changes in the exchange rate,
he could lay on a butterfly spread.

\[ \text{butterfly spread} \]

\[ \text{Sell 2 puts $1.90 strike.} \]

A butterfly spread is analogous to an interest rate collar; indeed
it’s sometimes called a zero-cost collar. Selling the 2 puts comes
close to offsetting the cost of buying the other 2 puts.

Options
- A motivated financial engineer can create almost
  any risk-return profile that a company might wish
to consider.
- Straddles and butterfly spreads are quite common.
- Notice that the butterfly spread costs our importer
  quite a bit less than a naïve strategy of buying call
  options.

Cross-Hedging
Minor Currency Exposure
- The major currencies are the: U.S. dollar,
  Canadian dollar, British pound, Euro, Swiss franc,
  Mexican peso, and Japanese yen.
- Everything else is a minor currency, like the Thai
  bhat.
- It is difficult, expensive, or impossible to use
  financial contracts to hedge exposure to minor
  currencies.

Hedging Contingent Exposure
- If only certain contingencies give rise to exposure,
  then options can be effective insurance.
- For example, if your firm is bidding on a
  hydroelectric dam project in Canada, you will
  need to hedge the Canadian-U.S. dollar exchange
  rate only if your bid wins the contract. Your firm
  can hedge this contingent risk with options.
Hedging through Invoice Currency

- The firm can shift, share, or diversify:
  - shift exchange rate risk
    - by invoicing foreign sales in home currency
  - share exchange rate risk
    - by pro-rating the currency of the invoice between foreign and home currencies
  - diversify exchange rate risk
    - by using a market basket index

Hedging via Lead and Lag

- If a currency is appreciating, pay those bills denominated in that currency early; let customers in that country pay late as long as they are paying in that currency.
- If a currency is depreciating, give incentives to customers who owe you in that currency to pay early; pay your obligations denominated in that currency as late as your contracts will allow.

Exposure Netting

- A multinational firm should not consider deals in isolation, but should focus on hedging the firm as a portfolio of currency positions.
  - As an example, consider a U.S.-based multinational with Korean won receivables and Japanese yen payables. Since the won and the yen tend to move in similar directions against the U.S. dollar, the firm can just wait until these accounts come due and just buy yen with won.
  - Even if it’s not a perfect hedge, it may be too expensive or impractical to hedge each currency separately.

Exposure Netting

- Many multinational firms use a reinvoice center. Which is a financial subsidiary that nets out the intrafirm transactions.
  - Once the residual exposure is determined, then the firm implements hedging.

Exposure Netting: an Example

Consider a U.S. MNC with three subsidiaries and the following foreign exchange transactions:

Bilateral Netting would reduce the number of foreign exchange transactions by half:
Multilateral Netting: an Example

Consider simplifying the bilateral netting with multilateral netting:

\[
\begin{align*}
&\text{US$25} & \text{CAD$10} & \text{GBP$20} \\
&\text{EUR$10} & \text{GBP$10} & \text{JPY$15} \\
&\text{CAD$10} & \text{EUR$30} & \text{GBP$15} \\
&\text{EUR$10} & \text{GBP$40} & \text{JPY$15} \\
&\text{JPY$20} & \text{EUR$20} & \text{USD$10}
\end{align*}
\]

Should the Firm Hedge?

- Not everyone agrees that a firm should hedge:
  - Hedging by the firm may not add to shareholder wealth if the shareholders can manage exposure themselves.
  - Hedging may not reduce the non-diversifiable risk of the firm. Therefore shareholders who hold a diversified portfolio are not helped when management hedges.

Should the Firm Hedge?

- In the presence of market imperfections, the firm should hedge.
  - Information Asymmetry
    - The managers may have better information than the shareholders.
  - Differential Transactions Costs
    - The firm may be able to hedge at better prices than the shareholders.
  - Default Costs
    - Hedging may reduce the firm’s cost of capital if it reduces the probability of default.

Should the Firm Hedge?

- Taxes can be a large market imperfection.
  - Corporations that face progressive tax rates may find that they pay less in taxes if they can manage earnings by hedging than if they have “boom and bust” cycles in their earnings stream.

What Risk Management Products do Firms Use?

- Most U.S. firms meet their exchange risk management needs with forward, swap, and options contracts.
- The greater the degree of international involvement, the greater the firm’s use of foreign exchange risk management.

End Chapter Eight