Chapter Objective:
This chapter provides a way to measure economic exposure, discusses its determinants, and presents methods for managing and hedging economic exposure.

Chapter Outline
- How to Measure Economic Exposure
- Operating Exposure: Definition
- An Illustration of Operating Exposure
- Determinants of Operating Exposure
- Managing Operating Exposure

Economic Exposure
- Changes in exchange rates can affect not only firms that are directly engaged in international trade but also purely domestic firms.
- Consider a U.S. bicycle manufacturer who sources and sells only in the U.S.
- Since the firm’s product competes against imported bicycles it is subject to foreign exchange exposure.

Economic Exposure
- Exchange rate risk as applied to the firm’s competitive position.
- Any anticipated changes in the exchange rates would have been already discounted and reflected in the firm’s value.
- Economic exposure can be defined as the extent to which the value of the firm would be affected by unanticipated changes in exchange rates.

How to Measure Economic Exposure
- Economic exposure is the sensitivity of the future home currency value of the firm’s assets and liabilities and the firm’s operating cash flow to random changes in exchange rates.
- There exist statistical measurements of sensitivity.
  - Sensitivity of the future home currency values of the firm’s assets and liabilities to random changes in exchange rates.
  - Sensitivity of the firm’s operating cash flows to random changes in exchange rates.
Channels of Economic Exposure

- Asset exposure
  - Home currency value of assets and liabilities
  - Exchange rate fluctuations
  - Operating exposure
  - Future operating cash flows

Firm Value

How to Measure Economic Exposure

- If a U.S. MNC were to run a regression on the dollar value ($P$) of its British assets on the dollar pound exchange rate, $S(S/£)$, the regression would be of the form:

$$P = a + b \times S + e$$

Where
- $a$ is the regression constant
- $e$ is the random error term with mean zero.

The regression coefficient $b$ measures the sensitivity of the dollar value of the assets ($P$) to the exchange rate $S$.

Example

- Suppose a U.S. firm has an asset in Britain whose local currency price is random.
- For simplicity, suppose there are only three states of the world and each state is equally likely to occur.
- The future local currency price of this British asset ($P^*$) as well as the future exchange rate ($S$) will be determined, depending on the realized state of the world.

Example (continued)

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>$P^*$</th>
<th>$S$</th>
<th>$S\times P^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>1/3</td>
<td>1.000</td>
<td>1.40</td>
<td>$1.40 \times 1.000 = 1.572$</td>
</tr>
<tr>
<td>Case 1</td>
<td>2/3</td>
<td>1.050</td>
<td>1.45</td>
<td>$1.45 \times 1.050 = 1.525$</td>
</tr>
<tr>
<td>Case 1</td>
<td>1/3</td>
<td>1.100</td>
<td>1.50</td>
<td>$1.50 \times 1.100 = 1.550$</td>
</tr>
</tbody>
</table>

How to Measure Economic Exposure

- The exposure coefficient shows that there are two sources of economic exposure:
  1. The variance of the exchange rate and
  2. The covariance between the dollar value of the asset and exchange rate

$$b = \frac{\text{Cov}(P,S)}{\text{Var}(S)}$$
Example (continued)

- In case one, the local currency price of the asset and the exchange rate are positively correlated.
  - This gives rise to substantial exchange rate risk.

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Probability</th>
<th>P*</th>
<th>S</th>
<th>SxP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£980</td>
<td>£1,400</td>
<td>£1,572</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,000</td>
<td>£1,500</td>
<td>£1,500</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,070</td>
<td>£1,600</td>
<td>£1,512</td>
</tr>
</tbody>
</table>

Example (continued)

- In case two, the local currency price of the asset and the exchange rate are negatively correlated.
  - This ameliorates the exchange rate risk substantially.
    (Completely in this example.)

<table>
<thead>
<tr>
<th>Case 2</th>
<th>Probability</th>
<th>P*</th>
<th>S</th>
<th>SxP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,000</td>
<td>£1,400</td>
<td>£1,400</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,050</td>
<td>£1,550</td>
<td>£1,400</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,075</td>
<td>£1,500</td>
<td>£1,400</td>
</tr>
</tbody>
</table>

Example (continued)

- In case three, the local currency price of the asset is fixed at £1,000.
  - This “contractual” exposure can be completely hedged.

<table>
<thead>
<tr>
<th>Case 3</th>
<th>Probability</th>
<th>P*</th>
<th>S</th>
<th>SxP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,000</td>
<td>£1,400</td>
<td>£1,400</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,000</td>
<td>£1,500</td>
<td>£1,500</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>£1,000</td>
<td>£1,600</td>
<td>£1,500</td>
</tr>
</tbody>
</table>

Operating Exposure: Definition

- The effect of random changes in exchange rates on the firm’s competitive position, which is not readily measurable.
- A good definition of operating exposure is the extent to which the firm’s operating cash flows are affected by the exchange rate.

An Illustration of Operating Exposure

- Recently, there was an enormous shortage in the shipping market from Asia, due to the Asian currency crisis.
- This affected not only the shipping companies, which enjoyed “boom times”.
- But also retailers, who experienced increased costs and delays.

An Illustration of Operating Exposure

- Note that the exposure for the retailers has two components:
  - The Competitive Effect
    - Difficulties and increased costs of shipping.
  - The Conversion Effect
    - Lower dollar prices of imports due to foreign currency exchange rate depreciation.
### Determinants of Operating Exposure

- Recall that operating exposure cannot be readily determined from the firm's accounting statements as can transaction exposure.
- The firm's operating exposure is determined by:
  - The market structure of inputs and products; how competitive or how monopolistic the markets facing the firm are.
  - The firm's ability to adjust its markets, product mix, and sourcing in response to exchange rate changes.

### Managing Operating Exposure

- Selecting Low Cost Production Sites
- Flexible Sourcing Policy
- Diversification of the Market
- R&D and Product Differentiation
- Financial Hedging

### Selecting Low Cost Production Sites

- A firm may wish to diversify the location of their production sites to mitigate the effect of exchange rate movements.
  - e.g. Honda built North American factories in response to a strong yen, but later found itself importing more cars from Japan due to a weak yen.

### Flexible Sourcing Policy

- Sourcing does not apply only to components, but also to “guest workers”.
  - e.g. Japan Air Lines hired foreign crews to remain competitive in international routes in the face of a strong yen, but later contemplated a reverse strategy in the face of a weak yen and rising domestic unemployment.

### Diversification of the Market

- Selling in multiple markets to take advantage of economies of scale and diversification of exchange rate risk.

### R&D and Product Differentiation

- Successful R&D that allows for
  - cost cutting
  - enhanced productivity
  - product differentiation.
- Successful product differentiation gives the firm less elastic demand—which may translate into less exchange rate risk.
Financial Hedging

- The goal is to stabilize the firm's cash flows in the near term.
- Financial Hedging is distinct from operational hedging.
- Financial Hedging involves use of derivative securities such as currency swaps, futures, forwards, currency options, among others.

End Chapter Nine