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

- Three Types of Exposure
  - Economic vs. Transaction vs. Translation
- Economic Exposure:
  - Measurement
  - Management
- Operating Exposure:
  - Definition & Illustration
  - Determinants
  - Management
Three Types of Exposure

1. 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.
Economic Exposure (continued)

- Changes in exchange rates can affect
  - firms directly engaged in international trade
  - purely domestic firms*
- Examples
  - US bike manufacturer who sources/sells only in the USA
    - Since the firm’s product competes against imported bicycles
      - it is subject to foreign exchange exposure.
  - High-end ski slope operator in the Alps
    - Even if the clientele is overwhelmingly from the EU, most of those customers will cross-shop with the Rockies or Andes.

2. Transaction Exposure

- This is the subject of Chapter 8.
- Definition
  - sensitivity of the “realized” domestic currency values of a firm’s contractual cash flows denominated in foreign currencies to unexpected exchange rate changes.
- Transaction exposure arises from fixed-price contracting in a world of constantly changing exchange rates.

Translation Exposure (Not Exam Material)

- The subject of Chapter 10.
- Definition
  - Exchange rate risk as applied to the firm’s consolidated financial statements.
    - Consolidation involves translation of subsidiaries’ financial statements from local currencies to home currency.
- Involves many controversial issues.
3. Economic Exposure

How to Measure Economic Exposure

- Economic exposure is the sensitivity
  - of (i) the future home currency value of the firm’s assets and liabilities and (ii) its operating cash flow to random changes in exchange rates
  - Investor’s perspective: Sensitivity of the future home-currency values of the firm’s assets and liabilities to random changes in exchange rates
    - Statistical measurement: regressions of stock price on FX rate
  - Manager’s perspective: Sensitivity of firm’s operating cash flows to random changes in exchange rates
    - Hard to measure: sales are endogenous → regressions ill advised

Channels of Economic Exposure
How to Measure Economic (Asset) 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, $S(\$/£)$, 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, $S$.

How to Measure Economic (Asset) Exposure

The exposure coefficient, $b$, is defined as follows:

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

Where $\text{Cov}(P, S)$ is the covariance between the dollar value of the asset and the exchange rate, and $\text{Var}(S)$ is the variance of the exchange rate.
How to Measure Economic (Asset) 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

\[ b = \frac{\text{Cov}(P, S)}{\text{Var}(S)} \]

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Technical issues with the regression analysis (NOT Exam Material)

- Endogeneity problem?
- Non-stationarity of the stock price & FX time series?
  - Levels vs. differences
- Time-varying variance?
  - (G)ARCH modeling?

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Asset Exposure: A Simple 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 & each state is equally likely to occur.

Finally, suppose that (1) the future local currency price of this British asset, say \( P^* \), and (2) the future exchange rate, say \( S \), will be determined depending on the realized state of the world.
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.
- Example? Cartier?

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>( P^* )</th>
<th>( S )</th>
<th>( S \times P^* )</th>
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</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>1/3</td>
<td>£980</td>
<td>$1.40/£</td>
<td>$1,372</td>
</tr>
<tr>
<td></td>
<td>1/3</td>
<td>£1,000</td>
<td>$1.50/£</td>
<td>$1,500</td>
</tr>
<tr>
<td></td>
<td>1/3</td>
<td>£1,070</td>
<td>$1.60/£</td>
<td>$1,712</td>
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</tbody>
</table>

Example (continued)

In case two, the local currency price of the asset and the exchange rate are negatively correlated.
- This ameliorates (i.e., reduces) the exchange rate risk substantially – completely, in this example.
- Example?

<table>
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<th>State</th>
<th>Probability</th>
<th>( P^* )</th>
<th>( S )</th>
<th>( S \times P^* )</th>
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</thead>
<tbody>
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<td>$1,400</td>
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<td></td>
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<td>£933</td>
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<td></td>
<td>1/3</td>
<td>£875</td>
<td>$1.60/£</td>
<td>$1,400</td>
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</table>

Example (continued)
Example (continued)

- In case three, the local currency price of the asset is fixed at £1,000
  - This "contractual" exposure can be completely hedged.
  - Realistic? Electric utility? Health Care?

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>$P^n*$</th>
<th>$S$</th>
<th>$S\times P^n*$</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1/3</td>
<td>£1,000</td>
<td>$1.40/£</td>
<td>$1,400</td>
</tr>
<tr>
<td>2</td>
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<td>$1.50/£</td>
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<tr>
<td>3</td>
<td>1/3</td>
<td>£1,000</td>
<td>$1.60/£</td>
<td>$1,600</td>
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</tbody>
</table>

3b. Operating Exposure

(Back to Exam Material)

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.
How to Measure Economic (Operating) Exposure

- Should we use regression analysis?
  - Endogeneity
    - Sales are a key decision variable of managers
- From the manager’s perspective, what matters?
  - Changes in the competitive position relative to foreign competitors
  - We know how to measure this: RER ("relative PPP")

Economic (Operating) Exposure and Real Exchange Rate

The real exchange rate index \( q^* = \frac{s_{t+T}'}{s_t'} \)

If PPP holds, then \( s_{t+T}' = s_t' \) so \( q^* = 1 \).

\( q^* < 1 \rightarrow \) foreign country’s competitiveness improves (and U.S. competitive position worsens);
\( q^* > 1 \rightarrow \) foreign country’s competitiveness worsens (and U.S. competitiveness improves).

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 firm’s markets are
    - Example: Latest export statistics for the Eurozone
  - The firm’s ability to adjust its markets, product mix, and sourcing in response to exchange rate changes.
Managing Operating Exposure

- (i) Selecting Low Cost Production Sites
- (ii) Flexible Sourcing Policy
- (iii) Diversification of the Market
- (iv) R&D and Product Differentiation
- (v) Financial Hedging

(i) 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 (partial) response to a strong yen, but later found itself importing more cars from Japan due to a weak yen.
  - Danger of losing economies of scale from too many production sites

(ii) 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.
(iii) Diversification of the Market

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

(iv) 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.

(v) 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