

# Chapter Objectives

- Discuss the relevance of an MNC's exposure to exchange rate risk.
- Explain how transaction exposure can be measured.
- Explain how economic exposure can be measured.
- Explain how translation exposure can be measured.

# Relevance of Exchange Rate Risk (1 of 2)

- When an MNC is exposed to exchange rate risk, its cash flows could be adversely affected by exchange rate movements.
- By reducing exchange rate exposure, MNC's may be able to stabilize their earnings and cash flows. This can reduce the risk that the MNC's stock valuation may decline.
- In general, the assumptions used to argue for exchange rate irrelevance are not realistic.

# Relevance of Exchange Rate Risk (2 of 2)

## Response from MNCs

Many financial reports of MNCs acknowledge how their cash flows can be adversely affected by exchange rate movements. Examples are provided here:

*In general, we are a net receiver of currencies other than the U.S. dollar. Accordingly, changes in exchange rates, and in particular a strengthening of the U.S. dollar, will negatively affect our revenue and other operating results as expressed in U.S. dollars.*

— Facebook

*Because we manufacture and sell products in a number of countries throughout the world, we are exposed to the impact on revenues and expenses of movements in currency exchange rates.*

— Proctor & Gamble Co.

*Increased volatility in foreign exchange rates ... may have an adverse impact on our business results and financial condition.*

—PepsiCo

# Exhibit 10.1 Is Exchange Rate Risk Relevant for MNCs?

ARGUMENT FOR WHY EXCHANGE RATE RISK IS IRRELEVANT FOR MNCs	ARGUMENT FOR WHY EXCHANGE RATE RISK IS RELEVANT FOR MNCs
<p>An MNC with cash flows in numerous currencies should not be affected by exchange rate risk if the adverse effects due to some currency movements are offset by the favorable effects of other currency movements.</p>	<p>Exchange rate effects on an MNC will not be offsetting, because the exchange rate movements of many currencies against the dollar go in the same direction over a specific period of time. Therefore, an MNC cannot ignore exchange rate risk, even when it has cash flows in numerous currencies.</p>
<p>If stakeholders (such as stockholders or creditors) have stakes in a well-diversified portfolio of MNCs, then their portfolio's value might be insulated if the adverse effects of exchange rates on some MNCs are offset by favorable effects of exchange rates on other MNCs. If these stakeholders can insulate their portfolios from exchange rate effects, then MNCs should not worry about exchange rate risk.</p>	<p>Many MNCs are similarly affected by exchange rate movements, so it would be difficult for stakeholders to create a diversified portfolio of MNCs that will be fully insulated from exchange rate movements. Because stakeholders cannot diversify away the exposure of their portfolios to exchange rate risk, MNCs should be concerned about their exposure to exchange rate risk.</p>
<p>Investors who invest in MNCs can hedge exchange rate risk on their own. If they believe that the investments in U.S.-based MNCs would be adversely affected when foreign currencies weaken against the dollar, they could take their own positions in currency derivatives that would increase in value if foreign currencies weaken against the dollar. Thus, if investors can hedge the exposure of their investments to exchange rate risk on their own, the MNCs may not need to worry about exchange rate risk.</p>	<p>Investors who invest in MNCs do not have complete information on each MNC's exposure to exchange rate fluctuations, so they may not have the ability to hedge the exposure of their individual investments to exchange rate risk. MNCs are better informed about their own exposure to exchange rate risk and should have more expertise in managing that risk. Thus, investors should benefit if MNCs manage their own exchange rate risk.</p>

# Transaction Exposure (1 of 7)

Definition: Sensitivity of the firm's contractual transactions in foreign currencies to exchange rate movements.

Assessing transaction exposure:

**Estimating net cash flows in each currency** (See Exhibits 10.2 & 10.3)

**Transaction Exposure of an MNC's Portfolio**

Measure potential impact of the **currency exposure**

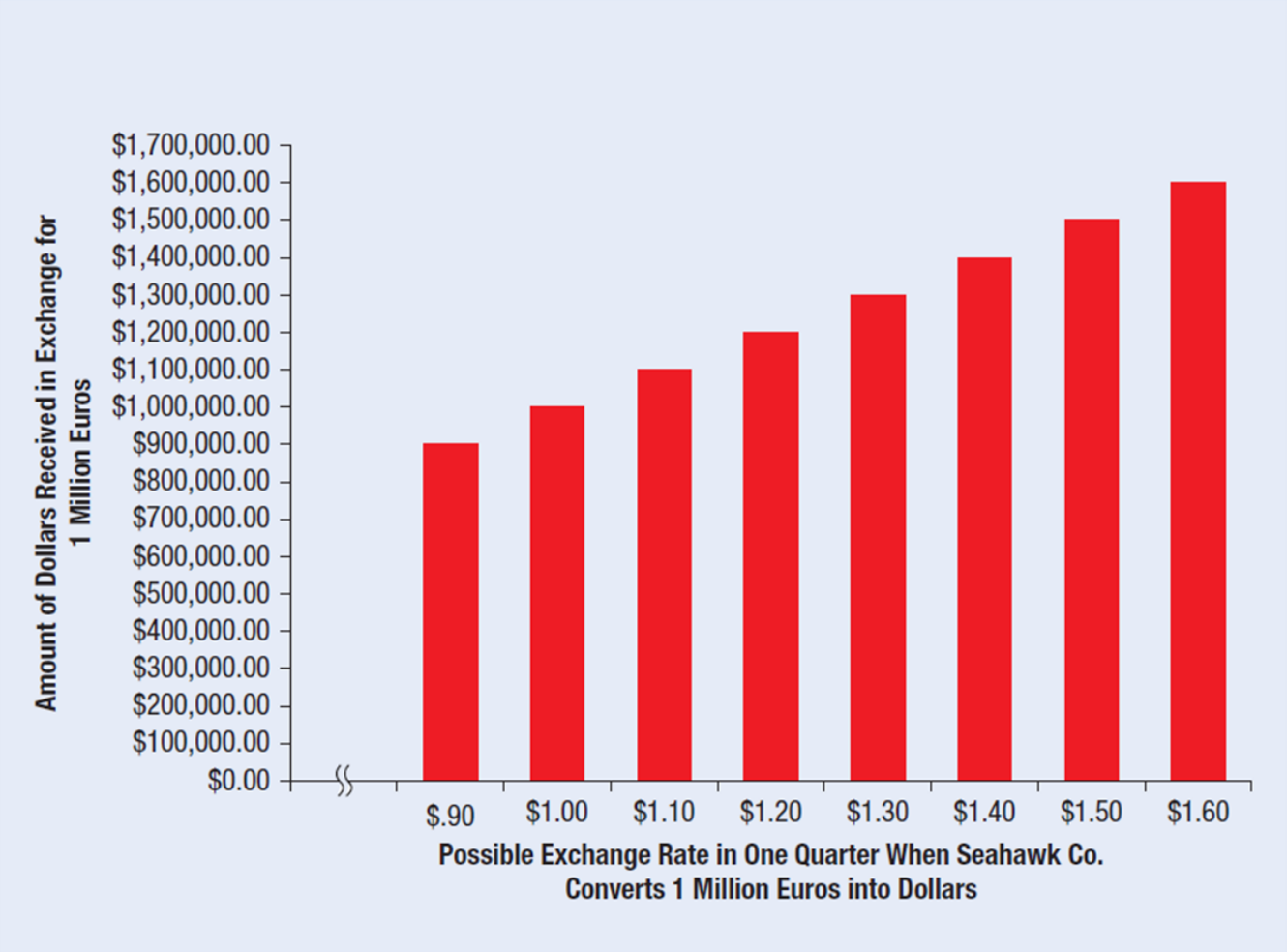
$$\sigma_p = \sqrt{W_x^2 \sigma_x^2 + W_y^2 \sigma_y^2 + 2W_x W_y \sigma_x \sigma_y \text{CORR}_{xy}}$$

$W$  = proportion of portfolio value in currency  $x$  or  $y$

$\sigma$  = standard deviation of percentage changes in currency  $x$  or  $y$

$\text{CORR}$  = correlation coefficient of percentage changes in currencies  $x$  and  $y$

# Exhibit 10.2 Amount of Dollars Needed to Obtain Imports (transaction value = 1 million euros)



# Exhibit 10.3 Consolidated Net Cash Flow Assessment of Miami Co.

(1)	(2)	(3)	(4)	(5)	(6)
CURRENCY	TOTAL INFLOW	TOTAL OUTFLOW	NET INFLOW OR OUTFLOW	EXPECTED EXCHANGE RATE AT END OF QUARTER	NET INFLOW OR OUTFLOW AS MEASURED IN U.S. DOLLARS
British pound	£17,000,000	£7,000,000	+£10,000,000	\$1.50	+\$15,000,000
Canadian dollar	C\$12,000,000	C\$2,000,000	+C\$10,000,000	\$.80	+\$8,000,000
Swedish krona	SK20,000,000	SK120,000,000	-SK100,000,000	\$.15	-\$15,000,000
Mexican peso	MXP90,000,000	MXP10,000,000	+MXP80,000,000	\$.10	+\$8,000,000

# Transaction Exposure (2 of 7)

## Exposure of an MNC's Portfolio (continued)

- **Measurement of currency volatility**
  - The **standard deviation** statistic measures the degree of movement for each currency. In any given period, some currencies clearly fluctuate much more than others.
- **Currency volatility over time**
  - The volatility of a currency may not remain consistent from one time period to another. An MNC can identify currencies whose values are most likely to be stable or highly volatile in the future.
- **Measurement of currency correlations**
  - The **correlations coefficients** indicate the degree to which two currencies move in relation to each other.



# Transaction Exposure (3 of 7)

## Exposure of an MNC's Portfolio (continued)

- **Applying currency correlations to net cash flows**
  - If an MNC has positive net cash flows in various currencies that are highly correlated, it may be exposed to exchange rate risk. However, many MNCs have some negative net cash flow positions in some currencies to complement their positive net cash flows in other currencies.

# Exhibit 10.4 Impact of Cash Flow and Correlation Conditions on an MNC's Exposure over the Next Period

IF THE MNC'S EXPECTED CASH FLOW SITUATION IS	AND IF THE CURRENCIES ARE	THEN THE MNC'S EXPOSURE IS RELATIVELY
Equal amounts of net inflows in two currencies	Highly correlated	High
Equal amounts of net inflows in two currencies	Slightly positively correlated	Moderate
Equal amounts of net inflows in two currencies	Negatively correlated	Low
A net inflow in one currency and a net outflow of about the same amount in another currency	Highly correlated	Low
A net inflow in one currency and a net outflow of about the same amount in another currency	Slightly positively correlated	Moderate
A net inflow in one currency and a net outflow of about the same amount in another currency	Negatively correlated	High

# Transaction Exposure (4 of 7)

## Transaction Exposure Based on Value at Risk (VaR)

- Measures the potential maximum 1-day loss on the value of positions of an MNC that is exposed to exchange rate movements.
- **Factors that affect the maximum 1-day loss:**
  - Expected percentage change in the currency rate for the next day
  - Confidence level used
  - Standard deviation of the daily percentage changes in the currency

$$\text{Maximum 1-day loss} = E(e_t) - (1.65 \times \sigma_{MXP})$$

# Transaction Exposure (5 of 7)

## Transaction Exposure Based on Value at Risk (VaR) (continued)

- **Applying VaR to Transaction Exposure of a Portfolio**

Since MNCs are commonly exposed to more than one currency, they may apply the VaR method to a currency portfolio. When considering multiple currencies, software packages can be used to perform the computations. Portfolio's standard deviation is estimated to be:

$$\sigma_p = \sqrt{W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \sigma_A \sigma_B CORR}$$

Where

$W_A$  = proportion of total portfolio value represented by Currency A

$W_B$  = proportion of total portfolio value represented by Currency B

$\sigma_A$  = standard deviation of quarterly percentage changes in Currency A

$\sigma_B$  = standard deviation of quarterly percentage changes in the value of Currency B

$CORR$  = correlation coefficient of quarterly percentage changes between Currency A and Currency B

# Transaction Exposure (6 of 7)

## Transaction Exposure Based on Value at Risk (VaR) (continued)

- **Estimating VaR with an Electronic Spreadsheet**

- Obtain the series of exchange rates for all relevant dates for each currency of concern and list each currency in its own column.
- Compute the percentage changes per period (from one date to the next) for each exchange rate in a column.
- Estimate the standard deviation of the column of percentage changes for each exchange rate.
- In a separate column, compute the periodic percentage change in the portfolio value by applying weights to the individual currency returns.
- Use a compute statement to determine the standard deviation of the column of percentage changes in the portfolio value.

# Transaction Exposure (7 of 7)

## Transaction Exposure Based on Value at Risk (VaR) (continued)

- **Limitations of VaR**

- If the distribution of exchange rate movements is not normal, the estimate of the maximum expected loss is subject to error.
- The VaR method assumes that the volatility (standard deviation) of exchange rate movements is stable over time. If exchange rate movements are less volatile in the past than in the future, the estimated maximum expected loss derived from the VaR method will be underestimated.

# Economic Exposure (1 of 2)

Definition: The sensitivity of the firm's cash flows to exchange rate movements, sometimes referred to as operating exposure.

## **Exposure to Foreign Currency Depreciation (Exhibit 10.5)**

Depreciation in the firm's foreign currency causes a reduction in both cash inflows and outflows. The impact on a firm's net cash flows will depend on whether the inflow transactions are affected more or less than the outflow transactions.

## **Exposure to Foreign Currency Appreciation**

Appreciation in the firm's foreign currency causes an increase in both cash inflows and outflows.

## **Measuring Economic Exposure**

Economic exposure by determining how its cash flows in the following period (such as the following quarter) would be affected by possible exchange rate scenarios.

# Exhibit 10.5 Economic Exposure of a U.S. Firm to Exchange Rate Fluctuations

<b>SOURCES OF U.S. FIRM'S DOLLAR CASH FLOWS</b>	<b>IMPACT OF FOREIGN CURRENCY DEPRECIATION ON U.S. FIRM'S DOLLAR CASH FLOWS</b>	<b>IMPACT OF FOREIGN CURRENCY APPRECIATION ON U.S. FIRM'S DOLLAR CASH FLOWS</b>
Local sales (relative to foreign competition in local markets)	Decrease	Increase
Firm's exports denominated in dollars	Decrease	Increase
Firm's exports denominated in foreign currency	Decrease	Increase
Interest received from foreign investments	Decrease	Increase
<b>SOURCES OF DOLLAR CASH OUTFLOWS</b>		
Firm's imported supplies denominated in dollars	No change	No change
Firm's imported supplies denominated in foreign currency	Decrease	Increase
Interest owed on foreign funds borrowed	Decrease	Increase



# Economic Exposure (2 of 2)

## Measuring Economic Exposure (Continued)

- **Use of regression analysis**

MNC can apply the following regression model to its quarterly cash flow and exchange rate data:

$$PCF_t = a_0 + a_1 e_t + \mu_t$$

where

$PCF_t$  = percentage change in inflation-adjusted cash flows measured in home currency

$e_t$  = percentage change in direct exchange rate

$\mu_t$  = random error term

$a_0$  = intercept

$a_1$  = slope coefficient

## Exhibit 10.6 Estimated Sales and Expenses for Madison's U.S. and Canadian Business Segments (millions of currency units)

	<b>U.S. BUSINESS</b>	<b>CANADIAN BUSINESS</b>
Sales	\$320	C\$4
Cost of materials	\$50	C\$200
Operating expenses	\$60	—
Interest expenses	\$3	C\$10
Cash flows	\$207	-C\$206

# Exhibit 10.7 Impact of Possible Exchange Rates on Cash Flows of Madison Co. (millions of currency units)

	EXCHANGE RATE SCENARIO IN C\$1 = \$.75	EXCHANGE RATE SCENARIO IN C\$1 = \$.80	EXCHANGE RATE SCENARIO IN C\$1 = \$.85
<b>Sales</b>			
(1) U.S. sales	\$320.00	\$320.00	\$320.00
(2) Canadian sales	C\$4 = \$ 3.00	C\$4 = \$ 3.20	C\$4 = \$ 3.40
(3) Total sales in U.S. \$	\$323.00	\$323.20	\$323.40
<b>Cost of Materials and Operating Expenses</b>			
(4) U.S. cost of materials	\$ 50.00	\$ 50.00	\$ 50.00
(5) Canadian cost of materials	C\$200 = \$150.00	C\$200 = \$160.00	C\$200 = \$170.00
(6) Total cost of materials in U.S. \$	\$200.00	\$210.00	\$220.00
(7) Operating expenses	\$ 60.00	\$ 60.00	\$ 60.00
<b>Interest Expenses</b>			
(8) U.S. interest expenses	\$ 3	\$ 3	\$ 3
(9) Canadian interest expenses	C\$10 = \$ 7.5	C\$10 = \$ 8	C\$10 = \$ 8.50
(10) Total interest expenses in U.S. \$	\$ 10.50	\$ 11.00	\$ 11.50
<b>Cash Flows in U.S. \$ before Taxes</b>	\$ 52.50	\$ 42.20	\$ 31.90

# Translation Exposure (1 of 4)

Definition: The exposure of the MNC's consolidated financial statements to exchange rate fluctuations.

## Determinants of translation exposure:

- **Proportion of business by foreign subsidiaries:** The greater the percentage of an MNC's business conducted by its foreign subsidiaries, the larger the percentage of a given financial statement item that is susceptible to translation exposure.
- **Locations of foreign subsidiaries:** Location can also influence the degree of translation exposure because the financial statement items of each subsidiary are typically measured by the respective subsidiary's home currency.

# Translation Exposure (2 of 4)

## Determinants of translation exposure (continued)

- **Accounting Methods:** MNC translation exposure is affected by accounting procedures, many of which are based on **FASB 52**
  - The functional currency of an entity is the currency of the economic environment in which the entity operates.
  - The current exchange rate of the reporting date is used to translate the assets and liabilities of a foreign entity from its functional currency into the reporting currency.

# Translation Exposure (3 of 4)

## Determinants of translation exposure (continued)

- **Accounting Methods (continued)**

- The weighted average exchange rate over the relevant period is used to translate revenue, expenses, and gains and losses of a foreign entity from its functional currency into the reporting currency.
- Translated income gains or losses due to changes in foreign currency values are not recognized in current net income but are reported as a second component of stockholder's equity; an exception to this rule is a foreign entity located in a country with high inflation.
- Realized income gains or losses due to foreign currency transactions are recorded in current net income, although there are some exceptions.

# Translation Exposure (4 of 4)

## Exposure of an MNC's Stock Price to Translation Effects

- Because an MNC's translation exposure affects its consolidated earnings, it can affect the MNC's valuation. (Exhibit 10.8)
- **Signals that complement translation effects:** Exchange rate conditions that cause a translation effect can also signal changes in expected cash flows in future years. Such changes could also influence the stock price.
- **Exposure of managerial compensation to translation effects:** Since an MNC's stock may be subject to translation effects and since managerial compensation is often tied to the MNC's stock price, it follows that managerial compensation is affected by translation effects.

# Exhibit 10.8 How Translation Exposure Can Affect the M N C's Stock Price

<b>YEAR</b>	<b>CONSOLIDATED EARNINGS</b>	<b>EARNINGS PER SHARE (EPS), COMPUTED AS CONSOLIDATED EARNINGS DIVIDED BY 10 MILLION SHARES OUTSTANDING</b>	<b>PREVAILING PRICE-EARNINGS (P/E) RATIO IN THE INDUSTRY</b>	<b>VALUATION OF PROVIDENCE CO. STOCK [EPS BASED ON PREVAILING P/E RATIO × EPS]</b>
1	\$17,000,000	\$1.70	20	$\$1.70 \times 20 = \$34$
2	\$15,000,000	\$1.50	20	$\$1.50 \times 20 = \$30$



# Summary (1 of 3)

- Exchange rate movements can affect an MNC's cash flows and therefore can affect its performance and value. MNCs with less risk can obtain funds at lower financing costs. Because they may experience more volatile cash flows due to exchange rate movements, exchange rate risk can also affect their financing costs. Thus MNCs frequently attempt to measure their exposure to exchange rate risk (as explained in this chapter), so that they can decide whether and how to hedge that risk (as explained in the next two chapters).

# Summary (2 of 3)

- Transaction exposure is the exposure of an MNC's contractual transactions to exchange rate movements. MNCs can measure their transaction exposure by determining their future payables and receivables positions in various currencies, along with the volatility levels and correlations of these currencies. From this information, they can assess how their revenue and costs may change in response to various exchange rate scenarios.

# Summary (3 of 3)

- Economic exposure is any exposure of an MNC's cash flows (direct or indirect) to exchange rate movements. MNCs can attempt to measure their economic exposure by determining the extent to which their cash flows will be affected by their exposure to each foreign currency.
- Translation exposure is the exposure of an MNC's consolidated financial statements to exchange rate movements. To measure translation exposure, MNCs can forecast their earnings in each foreign currency and then determine how their earnings could be affected by the potential exchange rate movements of each currency.