

Measuring Exposure to Exchange Rate Fluctuations

外幣暴險

⇒ 因公司持有外幣、外幣 AP 或外幣 AR，當外幣的價值發生變化，導致公司價格損失，反映在公司的財報上（匯率變動造成公司不利的影響）
稱「懷璧其罪」

★ Is exchange rate risk relevant?

購買力評價

① Purchasing Power Parity Argument

⇒ the exchange rate effect is offset by the change price.

$$\frac{E(S) - S}{S} = \frac{E(I_d - I_f)}{1 + E(I_f)}$$

PPP doesn't necessarily hold #

② The Investor Argument

⇒ Investor in MNCs can hedge this risk on their own. Assume investors have complete information on corporate exposure to exchange rate fluctuation as well as the capabilities to correctly insulate their individual exposure

Shareholders prefer corporations perform #

② Currency ^{多角化} Diversification Argument

⇒ A US based MNC is well diversified across numerous countries.

③ Stakeholder Diversification Argument

⇒ Stakeholder will be well diversified.

Systematic risk 系統性風險.

Creditors prefer MNCs maintain low exposure to exchange rate risk.

Response from MNCs

to the extent that MNCs can stabilize their earnings over time by hedging their exchange rate risk.



曝險種類

1. **Transaction Exposure** 交易曝險
2. **Economic Exposure** 經濟曝險 / 營運曝險
3. **Translation Exposure** 換算曝險 / 會計曝險.

⇒ 匯率無法精準被預測，但公司至少可以估計大體有多少曝險，如果高度曝險，就应考虑上列技巧來降低曝險。

1. 交易曝險 Transaction Exposure

⇒ The value of a firm's cash inflows received in various currencies will be affected by the respective exchange rates of these currencies when they are converted into the currency desired.

The degree to which the value of future cash transactions can be affected by exchange rate fluctuations is referred to as transaction exposure.

Transaction exposure ^{淨現金流量} net cash flow project the ^{合併} consolidated net amount in currency inflow or outflows for all its subsidiaries, categorized by currency.

It determines the MNC's ^{部位} overall position in each currency.

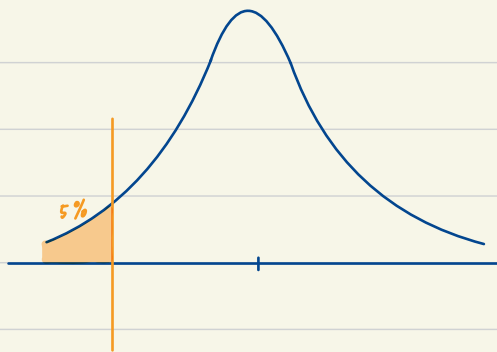
^量 long position = 持有
short position = 賣出

① transaction exposure 是根據貨幣的變異性 variability.
標準差統計. standard deviation statistic \Rightarrow currency variability over time.

② transaction exposure 是根據貨幣的相關性 correlation
投資組合風險如何衡量?
 \Rightarrow 差異 & 共變異的加權和 #

③ transaction exposure 是根據風險值 value-at-risk
標準差 相關性
VAR incorporates volatility and currency correlations to determine
the potential maximum one-day loss on the value of positions of MNC
that is exposed to exchange rate movements.

\Rightarrow 用統計的 99% 信心水準, 因為是損失, 以統計圖的左尾求算 #



(一)

新台幣 ↑ ↓ ↓ ↑	
美元應收款 FC inflow	↑ ↓
① 當美元升值	
② 當美元貶值	
③ 當日元升值	
④ 當日元貶值	
	日元應付款 FC outflow
	↑ ↓

(二)

net cash flow		新台幣
美元應收款 ↓		美元應付款 ↑
① 當美元貶值		

2. 經濟曝險 Economic Exposure

公司未來現金流量的現值

⇒ The degree to which a firm's present value of future cash flows can be influenced by exchange rate fluctuations is referred to as economic exposure to exchange rate.

All types of transactions that cause transaction exposure also cause economic exposure because these transactions represent cash flows that can be influenced by exchange rate fluctuations.

Economic Exposure represents any impact of exchange rate fluctuations in a firm's cash flow.

Corporate cash flows can be affected by exchange rate movement in many ways not directly associated with foreign transactions. A change in exchange rates that affects the demand can indirectly affect the cash flow.

- ① Economic exposure to local currency appreciation. 貨幣升值
- ② Economic exposure to local currency depreciation. 貨幣貶值
- ③ Economic exposure of domestic firm (國內公司)
- ④ Economic exposure of MNCs.

1. use of projected cash flow to assess economic exposure

⇒ An MNC must determine its economic exposure before it can manage its exposure. It can determine its exposure to each currency in terms of its cash inflow and cash outflow.

⇒ Sensitivity of earning to exchange rate 盈餘对匯率变动的敏感度.

Exhibit 10.8 Estimated Sales and Expenses for Madison's U.S. and Canadian Business Segments (in Millions)

	U.S. Business	Canadian Business
Sales	\$320	C\$4
Cost of materials	\$50	C\$200
Operating expenses	\$60	—
Interest expenses	\$3	C\$10
Cash flows	\$207	-C\$206

Exhibit 10.9 Impact of Possible Exchange Rates on Cash Flows of Madison Co. (in Millions)

	Exchange Rate Scenario		
	C\$1 = \$.75	C\$1 = \$.80	C\$1 = \$.85
Sales			
(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
Cost of Materials and Operating Expenses			
(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
Interest Expenses			
(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
Cash Flows in U.S. Dollars before Taxes	\$52.50	\$42.20	\$31.90

流出 >> 流入
加幣匯率升值越大
流入美國公司款項少

Exhibit 12.1 Original Impact of Possible Exchange Rates on Cash Flows of Madison Co. (in Millions)

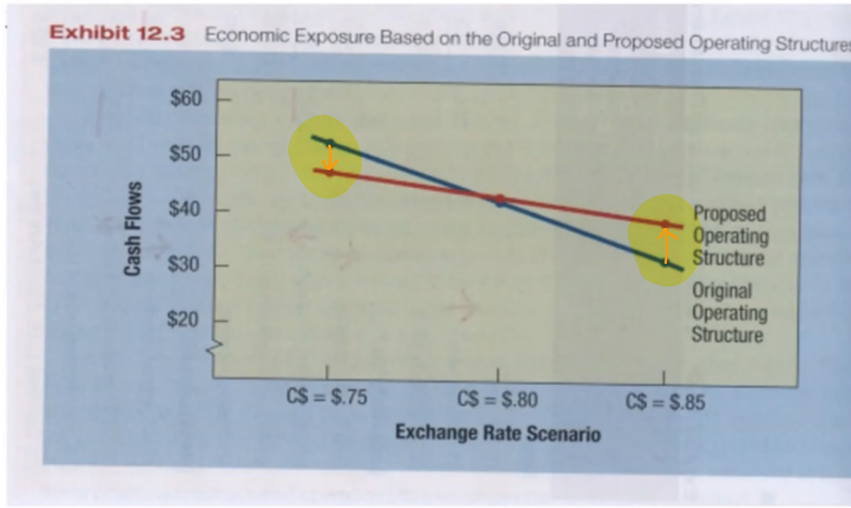
	Exchange Rate Scenario		
	CS1 = \$.75	CS1 = \$.80	CS1 = \$.85
Sales			
(1) U.S. sales	\$320.00	\$320.00	\$320.00
(2) Canadian sales 現金流入	CS4 = 3.00	CS4 = 3.20	CS4 = 3.40
(3) Total sales in U.S. \$	\$323.00	\$323.20	\$323.40
Cost of Materials			
(4) U.S. cost of materials	\$50.00	\$50.00	\$50.00
(5) Canadian cost of materials 現金流出	CS200 = 150.00	CS200 = 160.00	CS200 = 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
Interest Expenses			
(8) U.S. interest expenses	\$3	\$3	\$3
(9) Canadian interest expenses 現金流出	CS10 = 7.5	CS10 = 8	CS10 = 8.5
(10) Total interest expenses in U.S. \$	\$10.5	\$11	\$11.5
Cash flows in U.S. dollars before taxes	\$52.50	\$42.20	\$31.9

Exhibit 12.2 Impact of Possible Exchange Rate Movements on Earnings under Two Alternative Operational Structures (in Millions)

	Exchange Rate Scenario CS = \$.75		Exchange Rate Scenario CS = \$.80		Exchange Rate Scenario CS = \$.85	
	Original Operational Structure	Proposed Operational Structure	Original Operational Structure	Proposed Operational Structure	Original Operational Structure	Proposed Operational Structure
Sales						
(1) U.S. sales	\$320.0	\$320.00	\$320.00	\$320	\$320.00	\$320.00
(2) Canadian sales	CS4 = 3.0	CS20 = 15.00	CS4 = 3.20	CS20 = 16	CS4 = 3.40	CS20 = 17.00
(3) Total sales in U.S. \$	\$323.0	\$335.00	\$323.20	\$336	\$323.40	\$337.00
Cost of Materials						
(4) U.S. cost of materials	\$50.00	\$140.00	\$50.00	\$140	\$50.00	\$140.00
(5) Canadian cost of materials	CS200 = 150.00	CS100 = 75.00	CS200 = 160.00	CS100 = 80	CS200 = 170.00	CS100 = 85.00
(6) Total cost of materials in U.S. \$	\$200.00	\$215.00	\$210.00	\$220	\$220.00	\$225.00
(7) Operating expenses	\$60	\$62	\$60	\$62	\$60	\$62
Interest Expenses						
(8) U.S. interest expenses	\$3.0	\$7.00	\$3.00	\$7	\$3.00	\$7.00
(9) Canadian interest expenses	CS10 = 7.5	CS5 = 3.75	CS10 = 8.00	CS5 = 4	CS10 = 8.50	CS5 = 4.25
(10) Total interest expenses in U.S. \$	\$10.5	\$10.75	\$11.00	\$11	\$11.50	\$11.25
(11) Cash flows in U.S. dollars before taxes	\$52.5	\$47.25	\$42.2	\$43	\$31.9	\$38.75

- ⇒ 將加拿大生產設施、加拿大的原物料採購，大部份轉移到美國，增加在美國的生產設施和原物料採購
- 降低在加拿大的成本支出
- 增加在美國行銷支出費用，本行行銷公司在加拿大進行廣告活動。由於加拿大大力行銷，希望提升加拿大的營收
- 舉 US 新債還 CAN 負債，降 CAN 利息現金流出，∴ CAN 幣升值

Expediting the analysis with computer spreadsheets



⇒ 預期重啟後的現金流量，其變異/波動縮小。

* Issue involved in the restructuring decision.

- ① Should the firm attempt to increase or reduce sales in new or existing foreign country?
- ② Should the firm increase or reduce its dependency on foreign supplier?
- ③ Should the firm establish or eliminate production facilities in foreign market?
- ④ Should the firm increase or reduce its level of debt denominated in foreign currencies?

Exhibit 12.4 How to Restructure Operations to Balance the Impact of Currency Movements on Cash Inflows and Outflows

Type of Operation	Recommended Action When a Foreign Currency Has a Greater Impact on Cash Inflows	Recommended Action When a Foreign Currency Has a Greater Impact on Cash Outflows
Sales in foreign currency units	Reduce foreign sales	Increase foreign sales
Reliance on foreign supplies	Increase foreign supply orders	Reduce foreign supply orders
Proportion of debt structure representing foreign debt	Restructure debt to <u>increase</u> debt payments in foreign currency	Restructure debt to <u>reduce</u> debt payments in foreign currency

2. Hedging exposure to **fixed assets** (國是資產的避險)

Sales of these asset

⇒ by creating a **liability** that matches its expected value of the assets at the point in the future when they be **sold**.

But the MNC doesn't know (1) debt and (2) price?

* long term forward contract 遠期契約

A case study

Savor Co.'s dilemma

Assessment of economic exposure

Assessment of Each unit's exposure

Identifying the **source** of the unit's exposure

Possible strategies to hedge economic exposure

Exhibit 12.5 Assessment of Savor Co.'s Cash Flows and the Euro's Movements

(1) Quarter	(2) % Change in Unit A's Cash Flows	(3) % Change in Unit B's Cash Flows	(4) % Change in Unit C's Cash Flows	(5) % Change in Total Cash Flows	% Change in the Value of the Euro
1	-3	2	1	0	2
2	0	1	3	4	5
3	6	-6	-1	-1	-3
4	-1	1	-1	-1	0
5	-4	0	-1	-5	-2
6	-1	-2	-2	-5	-5
7	1	-3	3	1	4
8	-3	2	1	0	2
9	4	-1	0	3	-4

Assessment of Each Unit's Exposure

To determine the source of the exposure, Savor applies the regression model separately to each individual unit's cash flows. The results are shown here (apply the regression analysis yourself as an exercise):

Unit	Slope Coefficient
A	Not significant
B	Not significant
C	Coefficient = .45, which is statistically significant (F -squared = .80)

Measuring Economic exposure

Sensitivity of cash flows to exchange rates

Using Regression Analysis to Measure Economic Exposure. A firm's economic exposure to currency movements can also be assessed by applying regression analysis to historical cash flow and exchange rate data as follows:

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

where

PCF_t = percentage change in inflation-adjusted cash flows measured in the firm's home currency over period t

e_t = percentage change in the direct exchange rate of the currency over period t

μ_t = random error term

a_0 = intercept

a_1 = slope coefficient

M_t 母体平均值的符号、参数

3. 會計、換算風險 Translation Exposure

The exposure of MNC's consolidated financial statements to exchange rate fluctuation is known as translation exposure.

⇒ Cash flow perspective *paper work*

consolidated reporting *doesn't* affect an MNC's cash flows

subsidiary *remitting earning* will affect an MNC's cash flow.
實際現金流動

Stock price perspective ⇒ calculating P/E ratio.

合併報表計算母公司的市盈率，投資人做為投資決策。

Managing translation exposure

Translation exposure occurs when an MNC translates each subsidiary's financial data to its home currency for consolidated financial statements.

Even if translation exposure does not affect cash flows, it is a concern of many MNCs because it can reduce an MNC's consolidated earnings and thereby cause a decline in its stock price.

Accounting methods(FASB-52)

- 1.The functional currency of an entity is the currency of economic environment in which the entity operates.
- 2.The current exchange rates as of the reporting date is used to translate the assets and liabilities of a foreign entity from its functional currency into the reporting currency.

Accounting methods(FASB-52)

- 3.The weighted average exchange rate is used to translate revenue, expenses, and gains and losses of a foreign entity from its functional currency into the reporting currency.
- 4.Translated income gains or losses due to change 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 foreign entity located in a country with high inflation.

Accounting methods(FASB-52)

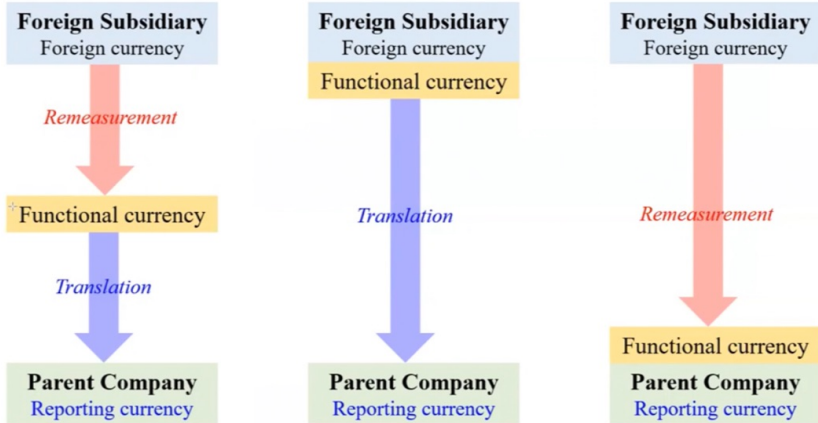
- 5.Realized income gains or losses due to foreign currency transactions are recorded in current net income, although there are some exceptions.

中級會計
將國外子公司資產負債表與損益表
合併到母公司去
有translation and remeasurement

Determinants of Translation Exposure

- 1.Proportion of its business conducted by foreign subsidiaries.
- 2.Location of foreign subsidiaries
- 3.Accounting methods

Remeasurement/Translation



第三國貨幣

Foreign Currency Remeasurement & Translation



Step 1) Remeasurement:

	Reported on I/S	Reported in OCI
Gains:	✓	✗
Losses:	✓	✗

Step 2) Translation:

	Reported on I/S	Reported in OCI
Gains:	✗	✓
Losses:	✗	✓

Managing translation exposure

Use of forward contracts to hedge translation exposure

If the pound depreciates over the year such that the average weighted exchange rate is \$1.50 over the year, the subsidiary's earnings will be translated as follows:

$$\begin{aligned} \text{Translated earnings} &= \text{Subsidiary earnings} \times \text{Weighted average exchange rate} \\ &= 20 \text{ million pounds} \times \$1.50 \\ &= \$30 \text{ million} \end{aligned}$$

paper work.

If the exchange rate had not declined over the year, the translated amount of earnings would have been \$32 million (computed as 20 million pounds \times \$1.60), so the exchange rate movements caused the reported earnings to be reduced by \$2 million.

However, there is a gain from the forward contract because the spot rate declined over the year. If we assume that the spot rate is worth \$1.50 at the end of the year, then the gain on the forward contract would be:

$$\begin{aligned} \text{Gain on forward contract} &= (\text{Amount received from forward sale}) - (\text{Amount paid to fulfill forward contract obligation}) \\ &= (20 \text{ million pounds} \times \$1.60) - (20 \text{ million pounds} \times \$1.50) \\ &= \$32 \text{ million} - \$30 \text{ million} \\ &= \$2 \text{ million} \end{aligned}$$

從市場上用 1.5 買進 20 百萬的英鎊，

在用盡期 1.6 賣掉 #

✦ limitations of hedging translation exposure

- ① Inaccurate earnings forecasts
- ② Inadequate forward contracts for some currencies
- ③ Accounting distortions
- ✦ Increased translation exposure

✦ Conclusion

- ① Some MNC subsidiaries may want to remit a port of their earnings
- ② The prevailing exchange rate may be used to forecast the expected cash flows that result from future remittances by subsidiaries.
- ③ Many investors use consolidated earnings to value MNCs.

$$V = \sum_{t=1}^n \left\{ \frac{E(CF_{s,t})}{(1+i)^t} \right\}$$

$$E(CF_{s,t}) = \sum_{j=1}^m [E(CF_{j,t}) \times E(S_{j,t})]$$