# International Business and Finance
# Seminar 11

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# Hedging

- As discussed in previous weeks, derivatives like options and futures are used to hedge risks
  - A hedge is a strategy that seeks to limit risk exposures in financial assets.
  - Hedging is the practice of taking a position in one market to offset and balance against the risk adopted by assuming a position in a contrary or opposing market or investment. The word hedge is from Old English *hecg*, originally any fence, living or artificial. The first known use of the word as a verb meaning 'dodge, evade' dates from the 1590s; that of 'insure oneself against loss,' as in a bet, is from the 1670s.

**Risk of Exchange Rate Fluctuations**:

Fluctuating exchanges rates cause a problem known as the importer-exporter dilemma:

**US importer:** $\$ \downarrow \Longrightarrow$ more expensive to import

**Foreign exporter to the US market:** $\$ \downarrow \Longrightarrow$ Assuming no change in the sale, they can get less due to the exchange rate

# Hedging 1: Future Contracts

- A currency forward contract is a contract that sets the exchange rate in advance. By entering into a currency forward contract, a firm can lock in an exchange rate in advance and reduce or eliminate its exposure to fluctuations in a currency's value.

**Using a Forward Contract to Lock In an Exchange Rate**

**Problem**

In December 2002, banks were offering one-year currency forward contracts with a forward exchange rate of \$0.987/€. Suppose that at that time, Manzini placed the order with Campagnolo with a price of 500,000 euros and simultaneously entered into a forward contract to purchase 500,000 euros at a forward exchange rate of \$0.987/€ in December 2003. What payment would Manzini be required to make in December 2003?

**Solution**

Even though the exchange rate rose to \$1.22/€ in December 2003, making the euro more expensive, Manzini would obtain the 500,000 euros using the forward contract at the forward exchange rate of \$0.987/€. Thus, Manzini must pay

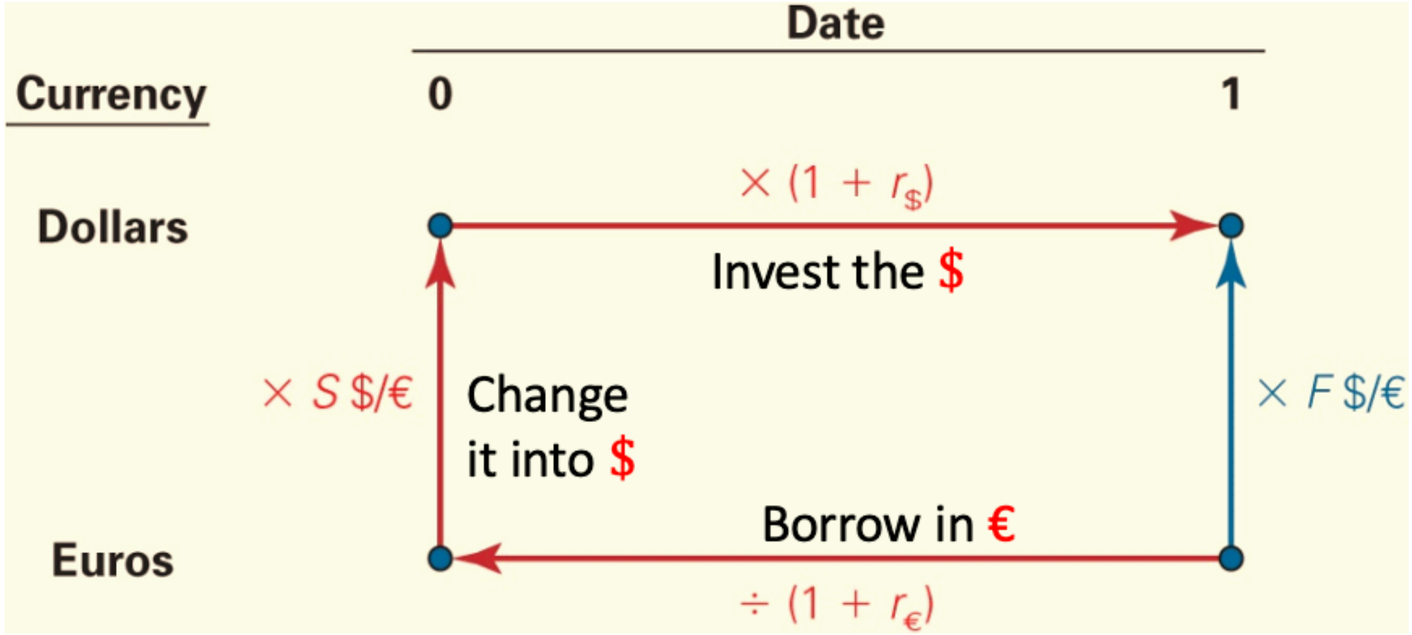
$$500{,}000 \text{ euros} \times \$0.987/€ = \$493{,}500 \text{ in December 2003}$$

Manzini would pay this amount to the bank in exchange for 500,000 euros, which are then paid to Campagnolo.

This forward contract would have been a good deal for Manzini because without the hedge, it would have had to exchange dollars for euros at the prevailing rate of \$1.22/€, raising its cost to \$610,000. However, the exchange rate could have moved the other way. If the exchange rate had fallen to \$0.85/€, the forward contract still commits Manzini to pay \$0.987/€. In other words, the forward contract locks in the exchange rate and eliminates the risk—whether the movement of the exchange rate is favorable or unfavorable.

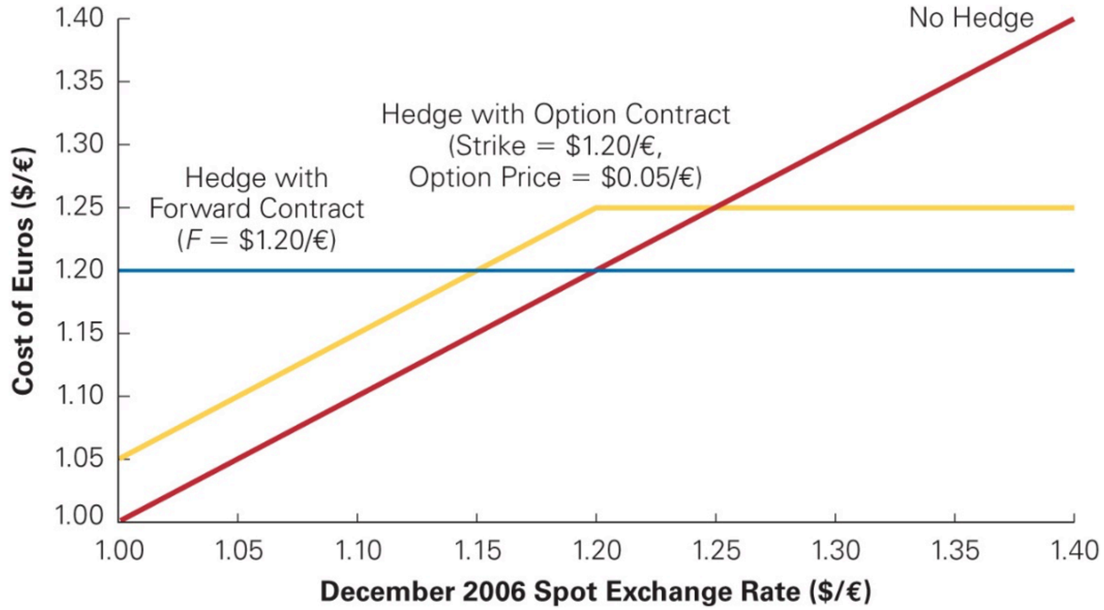
# Hedging 2: Cash-and-Carry

- A strategy used to lock in the future cost of an asset by buying the asset for cash today and "carrying" it until a future date. For the exchange currency, we borrow cash that we then invest (carry) in the future.
- Cash-and-carry strategy are often used by large banks as they can easily borrow at a very low transaction cost, but companies find the forward contracts much easier and, in some cases, more economical.



# Hedging 3: Option Contracts

- A firm that will need euros in one year can buy a call option on the euro, giving it the right to buy euros at a maximum price, while also being able to enjoy the premium if euro becomes weaker.
- If the firm hedges with a forward contract, it locks in the cost of euros at the forward exchange rate, and the firm's cost is fixed.
- If the firm hedges with options, it puts a cap on its potential cost, but it will benefit if the euro depreciates in value.



# Covered Interest Rate Parity

Consider a risky foreign asset that is expected to pay the cash flow, $C_{FC}$, in one period. In a normal market, the price of this asset in a foreign market is the present value of this cash flow using the cost of capital of a local investor, i.e.:

Price of the security in foreign currency

$$P_{FC} = \frac{C_{FC}}{(1 + r^*_{FC})}$$

$FC$ = foreign currency e.g. Euro (€)

A U.S. investor who wants to purchase this asset in dollars **will have to pay**

Price of the security in domestic currency

$$P_{\$} = S \times \frac{C_{FC}}{(1 + r^*_{FC})}$$

Where $S$ is the current spot exchange rate in dollars per foreign currency, $\left(\frac{\$}{€}\right)$.

By the Law of One Price, there should be no arbitrage opportunity, therefore, two present values should be equal, that is the PV of the securities expected cash flow in Dollar should be equal to the price of the security in Dollar:

$$\frac{F \times C_{FC}}{(1 + r^*_{\$})} = S \times \frac{C_{FC}}{(1 + r^*_{FC})}$$

- by rearranging terms, we have:

$$F = S \times \frac{(1 + r^*_{\$})}{(1 + r^*_{FC})}$$

$\frac{\$ \text{ in one year}}{FC \text{ in one year}}$ $\quad$ $\frac{\$ \text{ today}}{FC \text{ today}}$

# NPV, WACC, and Valuation

- Recall that
  - NPV, Net present value, is a measure of "is it a good deal?"
  - When talking about international trade, the discount rate has one more layer of complexity: currency exchange rate

$$NPV = \sum_{i=1}^{t} \frac{C_i}{(1+r)^i} - I_0 > 0$$

$$NPV = \sum_{i=1}^{t} \frac{C_i}{(1+r)^i} - \sum_{j=0}^{m} \frac{I_j}{(1+r)^j} > 0 \quad (m \le t)$$

- **Valuation of Foreign Currency Cash Flows:** In an internationally integrated capital market, two equivalent methods are available for calculating the NPV of a foreign project.

A. Calculate the NPV in the foreign country and convert it to the local currency at the spot rate.

B. Convert the cash flows of the foreign project into the local currency and then calculate the NPV of these cash flows.

# NPV, WACC, and Valuation

- WACC: weighted average cost of capital
  - Essentially, a generalization of all the costs

## Company Cost of Capital (With No Debt)

If a company has no outstanding debt and the risk of a project is not much deviated from the firm's existing projects, then the company cost of equity (or equity cost of capital), which is obtained from the security market line (SML), is equal to the company cost of capital:

$$r_E = r_f + \beta_E . (r_m - r_f)$$

- If $r_D = r_f + Credit\ risk\ rate$ represents the rate of paying debt ( to lenders or bondholders) then

$$\boldsymbol{Company\ cost\ of\ capital} = \frac{\boldsymbol{D}}{\boldsymbol{V}} . \boldsymbol{r_D} + \frac{\boldsymbol{E}}{\boldsymbol{V}} . \boldsymbol{r_E} = \frac{\boldsymbol{D}}{\boldsymbol{D+E}} . \boldsymbol{r_D} + \frac{\boldsymbol{E}}{\boldsymbol{D+E}} . \boldsymbol{r_E} = \boldsymbol{r_{WACC}}$$

Expected return on all assets of a company

In some books, the company cost of capital is also called asset cost of capital or overall cost of capital.
For example, for a company with a balance sheet composed of 40% debt and 60% equity, if $r_D$ and $r_E$ are 8% and 12% respectively, then the company cost of capital will be:

$$Company\ cost\ of\ capital(WACC) = 8\times0.4 + 12\times0.6 = 10.4\%$$

- The real interest paid to the lenders can be obtained after deducting tax. So, after-tax cost of debt will be $(1-\tau).r_D$ and eventually the weighted average cost of capital (WACC) can be calculated by:

$$\textbf{After} - \textbf{tax WACC} = \boldsymbol{r_{WACC}} = \boldsymbol{(1-\tau) r_D} \cdot \frac{\boldsymbol{D}}{\boldsymbol{V}} + \boldsymbol{r_E} \cdot \frac{\boldsymbol{E}}{\boldsymbol{V}}$$

Now, it will be easy to calculate the PV of the investment project by applying WACC as a discount rate:

$$PV = \sum_{i=1}^{N} \frac{C_i}{(1 + r_{WACC})^i}$$

# NPV, WACC, and Valuation

7. **The dollar cost of debt for John Galt Industries is 8.0%. The firm faces a tax rate of 40% on all income, no matter where it is earned. Galt needs to know its Yen cost of debt. The risk-free interest rates on dollars and yen are r$ = 6% and r¥ = 2%, respectively. Galt is willing to assume that capital markets are internationally integrated and that its free cash flows are uncorrelated to the yen-dollar spot rate. Galt's after-tax cost of debt in yen is closest to:**

A. 0.9%
B. 2.0%
C. 3.9%
D. 4.8%

**Question 7:**

After tax WACC= $r(1-\tau)$= 8%(1 - 40%) = 4.8%

$$r^*_{¥} = \frac{1 + r_{¥}}{1 + r_{\$}}(1 + r^*_{\$}) - 1 = \frac{1.02}{1.06}(1 + .048) - 1 = 0.008453 \text{ or } .845\%$$

# Example

- **Question**: Ityesi, Inc. wants to apply the WACC technique to value a project in the United Kingdom. The project will be completely self-contained in the United Kingdom, such that all revenues are generated and all costs are incurred there. The technology used in the new products will be obsolete after four years. Annual sales are expected to be £37.5 million per year. Manufacturing costs and operating expenses are expected to total £15.625 million and £5.625 million per year, respectively. Developing the product will require an upfront investment of £15 million in capital equipment that will be obsolete in four years and an initial marketing expense of £4.167 million. Ityesi pays a corporate tax rate of 40% no matter in which country it manufactures its products. Assume the current spot exchange rate, $S$, is 1.60 $\left(\frac{\$}{£}\right)$, also assume the risk-free rate on dollars, $r_{\$}$, is 4% and the risk-free interest rate on pounds, $r_{£}$, is 7%. Using the tables below find the value of Ityesi's foreign project with WACC.

Ityesi's Current Market Value Balance Sheet ($ millions) and Cost of Capital Without the U.K. Project

| Assets | | Liabilities | | Cost of Capital | |
|---|---|---|---|---|---|
| Cash | 20 | Debt | 320 | Debt | 6% |
| Existing Assets | 600 | Equity | 300 | Equity | 10% |
| | 620 | | 620 | | |

| | Year | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| **Incremental Earnings Forecast (£ millions)** | | | | | | |
| 1 | Sales | — | 37.500 | 37.500 | 37.500 | 37.500 |
| 2 | Cost of Goods Sold | — | (15.625) | (15.625) | (15.625) | (15.625) |
| 3 | **Gross Profit** | — | 21.875 | 21.875 | 21.875 | 21.875 |
| 4 | Operating Expenses | (4.167) | (5.625) | (5.625) | (5.625) | (5.625) |
| 5 | Depreciation | — | (3.750) | (3.750) | (3.750) | (3.750) |
| 6 | **EBIT** | (4.167) | 12.500 | 12.500 | 12.500 | 12.500 |
| 7 | Income tax at 40% | 1.667 | (5.000) | (5.000) | (5.000) | (5.000) |
| 8 | **Unlevered Net Income** | (2.500) | 7.500 | 7.500 | 7.500 | 7.500 |
| **Free Cash Flow** | | | | | | |
| 9 | Plus: Depreciation | — | 3.750 | 3.750 | 3.750 | 3.750 |
| 10 | Less: Capital Expenditures | (15.000) | — | — | — | — |
| 11 | Less: Increases in NWC | — | — | — | — | — |
| 12 | **Pound Free Cash Flow** | **(17.500)** | **11.250** | **11.250** | **11.250** | **11.250** |

- **Answer**: Using the covered interest rate parity condition we can calculate forward exchange rates:

$$F_1 = S \times \frac{(1 + r_\$)}{(1 + r_£)} = (\$1.60/£)\frac{(1.04)}{(1.07)} = \$1.5551/£$$

$$F_2 = S \times \frac{(1 + r_\$)^2}{(1 + r_£)^2} = (\$1.60/£)\frac{(1.04)^2}{(1.07)^2} = \$1.5115/£$$

$$F_3 = S \times \frac{(1 + r_\$)^3}{(1 + r_£)^3} = (\$1.60/£)\frac{(1.04)^3}{(1.07)^3} = \$1.4692/£$$

$$F_4 = S \times \frac{(1 + r_\$)^4}{(1 + r_£)^4} = (\$1.60/£)\frac{(1.04)^4}{(1.07)^4} = \$1.4280/£$$

## Free Cash Flow Conversion:

- Using these forward exchange rates, the expected free cash flows in dollars can be calculated by multiplying the expected cash flows in pounds by the forward exchange rate:

| | | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| **Dollar Free Cash Flow ($ millions)** | | | | | | |
| 1 | Pound FCF (£ millions) | (17.500) | 11.250 | 11.250 | 11.250 | 11.250 |
| 2 | Forward Exchange Rate ($/£) | 1.600 | 1.555 | 1.512 | 1.469 | 1.428 |
| 3 | **Dollar Value of Pound FCF** (1 × 2) | (28.000) | 17.495 | 17.004 | 16.528 | 16.065 |

**The Value of Ityesi's Foreign Project with WACC:**

- With the cash flows of the U.K. project now expressed in dollars, the foreign project can be valued as if it were a domestic U.S. project.
- Ityesi's WACC is calculated as follows:

$$r_{wacc} = \frac{E}{E+D}.r_E + \frac{D}{E+D}.r_D(1-\tau_C) = (0.5)(10.0\%) + (0.5)(6.0\%)(1-40\%) = 6.8\%$$

➢ **Note**: Ityesi's net debt is $320 million in debt minus the $20 million in cash for net debt of $300 million.

- The present value of the future free cash flows is:

$$\frac{17.495}{1.068} + \frac{17.004}{1.068^2} + \frac{16.528}{1.068^3} + \frac{16.065}{1.068^4} = \$57.20 \text{ million}$$

- Given the upfront cost of launching the product line in dollars is only $28 million, the net present value is $29.20 million: $57.20 – $28 = $29.20

- Ityesi could have computed the foreign NPV by discounting the foreign cash flows at the foreign cost of capital and converting this result to a domestic NPV using the spot rate.
- Determining the NPV, in this case, requires knowing the foreign cost of capital.
- Assume the foreign cost of capital is $r_{£}^{*}$. So, the foreign cost of capital must satisfy the Law of One Price:

$$(1 + r_{£}^{*}) = \frac{S}{F}(1 + r_{\$}^{*})$$

- To calculate $r_{£}^{*}$, we the get help of the covered interest rate parity, where $r_{£}$ and $r_{\$}$ are the foreign and domestic risk-free interest rates, respectively: $\frac{S}{F} = \frac{1 + r_{£}}{1 + r_{\$}}$
- **The foreign cost of capital must satisfy the Law of One Price:** The foreign cost of capital in terms of the domestic cost of capital and interest rates is the Foreign-Denominated Cost of Capital, which can be obtained by combining the above equations. So,

$$1 + r_{£}^{*} = \frac{1 + r_{£}}{1 + r_{\$}}\left(1 + r_{\$}^{*}\right) \Leftrightarrow r_{£}^{*} \approx r_{£} + (r_{\$}^{*} - r_{\$})$$

Hint: $Ln(1 + X) \approx X$ when $X \approx 0$

So, we can estimate the foreign cost of capital $r_{£}^{*}$, using domestic cost of capital $r_{\$}^{*}$ and risk-free interest rates $r_{£}$ and $r_{\$}$.

## Internationalizing the Cost of Capital

### Problem

Use the Law of One Price to infer the pound WACC from Ityesi's dollar WACC. Verify that the NPV of Ityesi's project is the same when its pound free cash flows are discounted at this WACC and converted at the spot rate.

### Solution

Using Eq. 31.7 to compute the pound WACC gives

$$r^*_{£} = \frac{1 + r_{£}}{1 + r_{\$}}(1 - r^*_{\$}) - 1 \left( \frac{1.07}{1.04} \right)(1.068) - 1 = 0.0988$$

The pound WACC is 9.88%.

We can now use Ityesi's pound WACC to calculate the present value of the pound free cash flows in Table 31.3:

$$\frac{11.25}{1.0988} + \frac{11.25}{1.0988^2} + \frac{11.25}{1.0988^3} + \frac{11.25}{1.0988^4} = £35.75 \text{ million}$$

The NPV in pounds of the investment opportunity is $35.75 - 17.5 = £18.25$ million. Converting this amount to dollars at the spot rate gives £18.25 million $\times$ 1.6\$/£ = \$29.20 million, which is exactly the NPV we calculated before.