Lesson IX: Overview

1. Working within an international context: exposures and risks

2. Hedging techniques

Working within an international context: exposures and risks

Risk vs Exposure

Risk relates to the **variability in the values** of assets and liabilities, due to unexpected events and occurrences.

Exposure is the **amount at risk**.

Different Risks and Exposures

1. **Foreign exchange** risk and exposure

2. **Operating** risk and exposure

3. **Country** risk and exposure

Foreign exchange exposure I

Foreign exchange exposure: <u>sensitivity</u> of changes in the <u>real domestic currency value</u> of assets and liabilities to changes in exchange rates.

$$Exposure = \frac{\Delta V_{(DC)}}{\Delta S_{(DC \, / \, FC)}}$$

Foreign exchange exposure II

$$Exposure = \frac{\Delta V_{(DC)}}{\Delta S_{(DC/FC)}}$$

Measured in **monetary terms** (can you find the currency of measurement?)

Exposure on the same asset/liability varies depending on which currency is considered as domestic/foreign

Foreign exchange exposure III

1. Exposure on **contractual** assets and liabilities

2. Exposure on **non-contractual** assets and liabilities

Contractual assets and liabilities

Assets or payment obligations with a **fixed face and market values** (e.g. bank accounts/ deposits, accounts receivable/ payable…)

Exposure on contractual A&L

Suppose:

• €-denominated bank account = €1,000

• $S_{\$/€}$ from $1.1_{\$/€}$ to $1.2_{\$/€}$

$$Exposure = \frac{\Delta V_{(DC)}}{\Delta S_{(DC/FC)}} = \frac{.1 \cdot 1,000}{.1} = €1,000$$

What if we dealt with a bank loan?

Terminology

Long (short) position: an investor is long (short) in a currency if she or he gains (loses) when the spot value of the currency increases, and loses (gains) when it decreases.

Non contractual assets and liabilities

Assets or payment obligations **without a fixed face and market values** (e.g. shares, foreign currency-denominated bonds…)

FX exposure on non contractual A/L I

Suppose:

- Shares (initial price)= €10
- The shares belong to a European company exporting to the USA
- $S_{\$/€}$ from $1.1_{\$/€}$ to $1.2_{\$/€}$ → the € appreciation harms the exporting company's competitiveness: the shares' price drops to €9.50

FX exposure on non contractual A/L II

$$Exposure = \frac{\Delta V_{(DC)}}{\Delta S_{(DC/FC)}} = \frac{(1.2 \cdot 9.5) - (1.1 \cdot 10)}{.1} = \frac{11.4 - 11}{.1} = €4$$

The € appreciation has increased the $ value of the investment, although part of this benefit has been eroded due to the lower firm's competitiveness in int'l mkts.

Is the US investor long or short EUR? Why?

More on FX exposure and N-C A&L

Exposure depends on the extent to which the currency value and the asset value are **related**

Co-variation between the FX rate and the foreign currency value of assets

FC bonds & FX exposure I

Suppose:

- Bond (initial price)= €1000
- The ECB follows a policy of "leaning against the wind"
- $S_{\$/€}$ from $1.1_{\$/€}$ to $1.2_{\$/€}$ → after the € appreciation, the ECB lowers the interest rates, thus forcing bonds' prices up to €1,050

FC bonds & FX exposure II

$$Exposure = \frac{\Delta V_{(DC)}}{\Delta S_{(DC/FC)}} = \frac{(1.2 \cdot 1,050) - (1.1 \cdot 1,000)}{.1} = \frac{1,260 - 1,100}{.1} = €1,600$$

The exposure is **larger** than the value of the bond

FC bonds & FX exposure III

Does an investor buying exclusively domestic currency – denominated bonds face any foreign exchange exposure? Why?

Foreign exchange risk

Exchange rate risk: **standard deviation** of domestic currency values of assets or liabilities attributable to **unanticipated** changes in exchange rate.

Exposure, Risk and CIRP

$$(1+r_D)^n = \frac{F(_{nD/F})}{S(_{D/F})}(1+r_F)^n$$

Assume that the foreign currency-denominated security is **held to maturity** (when the fwd contract also expires). Does this transaction bear any FX exposure/risk?

Exposure, Risk and PPP

Suppose that $\Delta S = \Delta P_D - \Delta P_F$ holds and assume a positive inflationary shock occurs in the foreign country. Will a domestic investor have to face any FX risk/ exposure on a real estate investment? Why?

One lesson to learn

It is **possible** to face **foreign exchange exposure** on **domestic assets** and **NOT** face exposure on **foreign assets**.

Operating exposure I

Operating exposure: effects of exchange rates on revenues, costs (and, consequently, profits).

Does a domestic firm with no direct business relationships abroad face operating risk?

Operating exposure II

Operating exposure is very difficult to eliminate.

"Residual FX exposure"

Country risk I

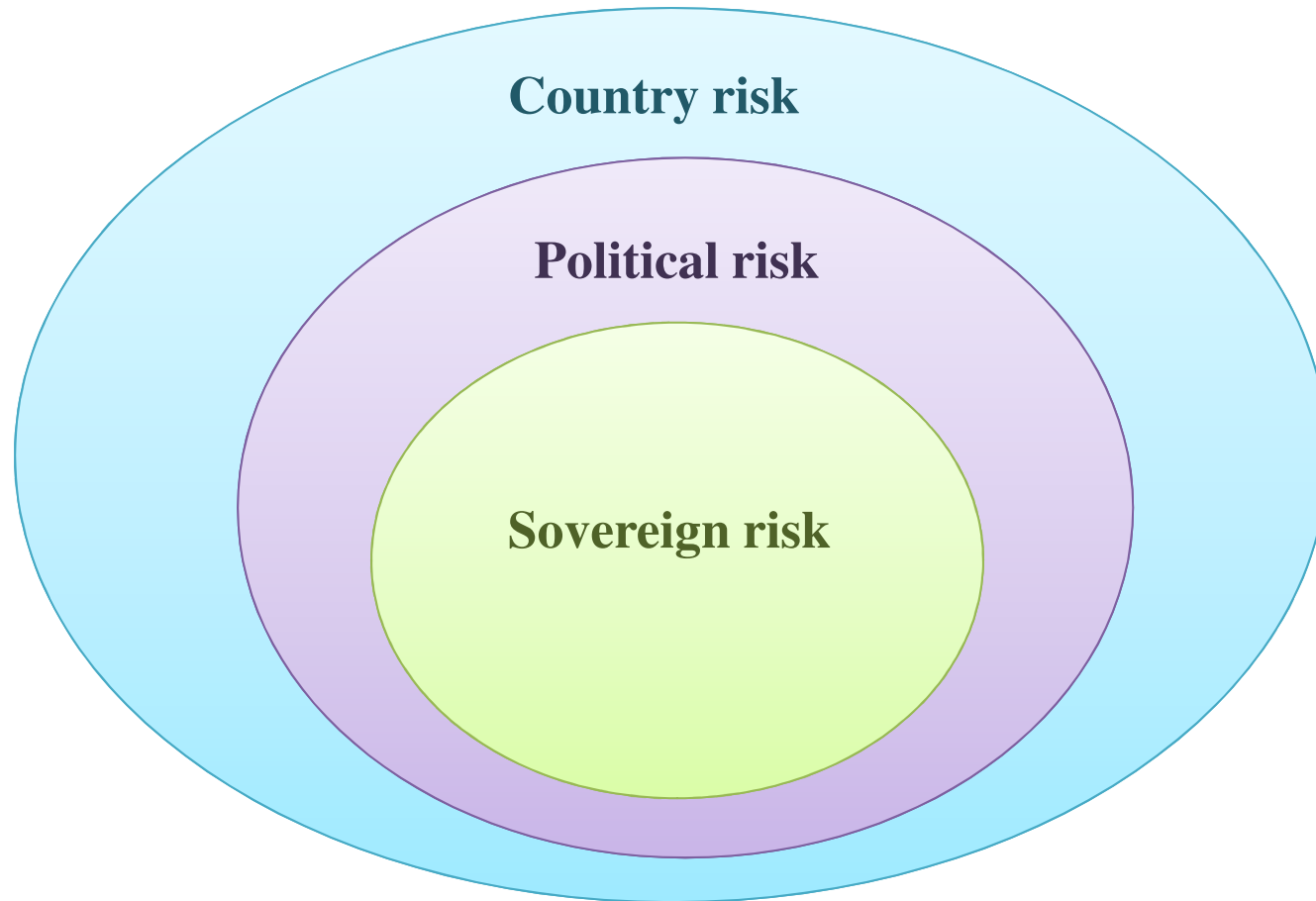***Country risk***: possibility of <u>losses</u> due to <u>country-specific</u> economic, political and social <u>events</u>

Uncertainty surrounding payments from abroad or assets held abroad due to the possibility of war, revolution, asset seizure, or other similar events.

Country risk II

Country risk

Political risk

Sovereign risk

Country risk III

Sovereign risk: possibility of losses on claims to foreign governments or government agencies.

Political risk: additional possibility of losses on private claims (including FDIs).

Country risk IV

- **Confiscation** (Government takeover without compensation);

- **Expropriation** (Government takeover with compensation);

- **Wars**, **revolutions**;

- **Changed legal environment** (restrictions on income repatriation, tax regimes…)

Euromoney's country risk rating scheme

Several specialists are asked to give their opinions on each country based on a few pre-selected factors (indicators):

- **Analytical indicators** (economic and political-risk evaluations);
- **Credit indicators** (measures of a country's credit worthiness - ability to service debt);
- **Market indicators** (measures of a country's access to bank loans, short term credits and bond mkts).

Country risk rankings 2013 I

www.euromoneycountryrisk.com
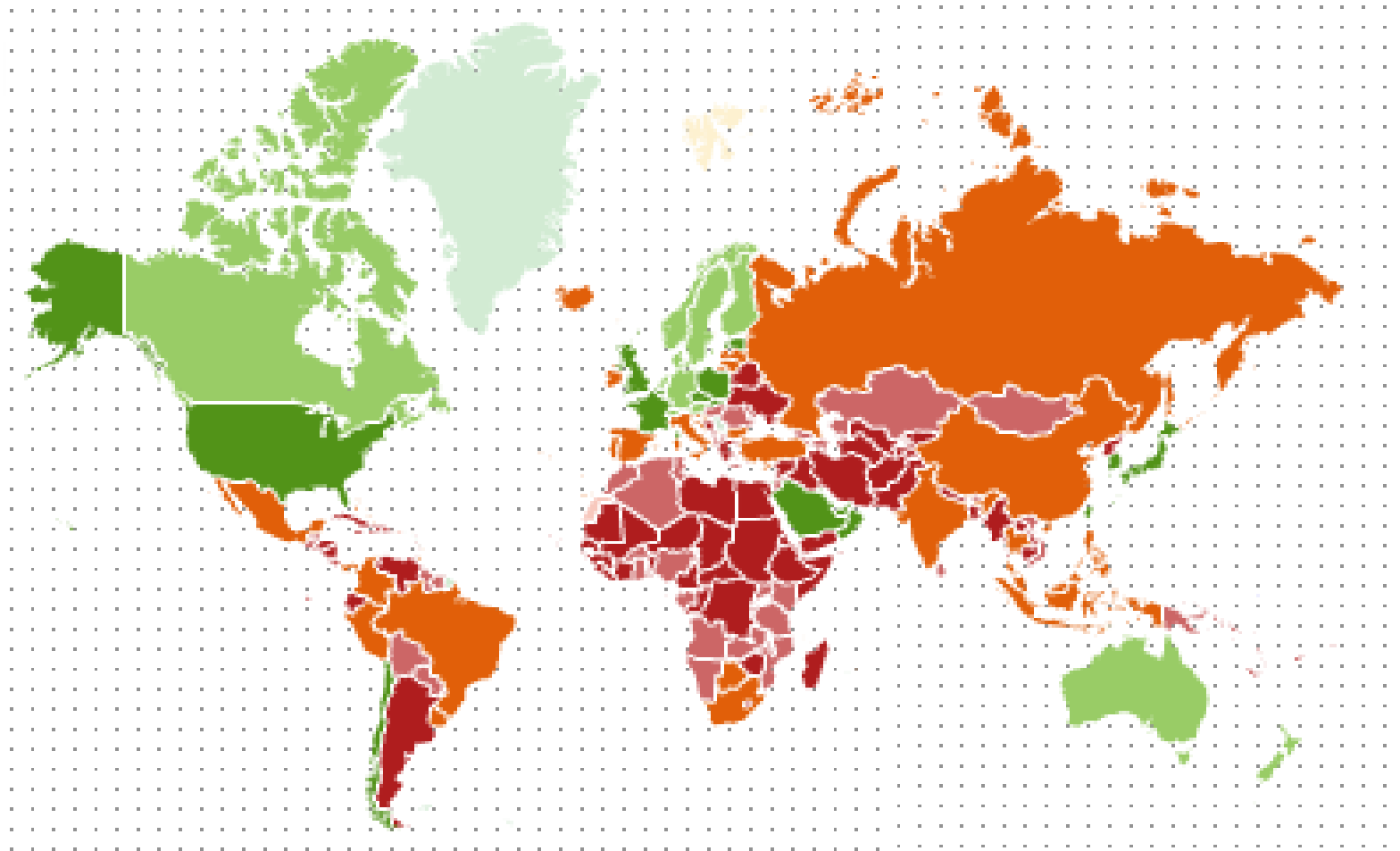
Country risk rankings 2013 II

World risk average

Score	42.62	-0.34 ▼
Economic assessment	44.79	+0.01 ▲
Political assessment	46.05	0.00 ▶
Structural assessment	39.93	+0.01 ▲
Access to capital	40.30	-3.34 ▼
Credit ratings	31.49	-0.08 ▼
Debt indicators	41.85	0.00 ▶

Country movers

▲ Less risk	▼ More risk	
Laos	16.44	+7.22 ▲
Peru	60.28	+3.16 ▲
Mongolia	41.53	+2.25 ▲
Macau	64.76	+2.00 ▲
Bhutan	27.85	+1.87 ▲

Country movers

▲ Less risk	▼ More risk	
St Vincent & Grenadines	33.52	-4.33 ▼
Cuba	17.82	-3.75 ▼
Ecuador	34.90	-3.50 ▼
Paraguay	41.11	-3.50 ▼
St Lucia	33.26	-3.50 ▼

Country risk rankings 2013 III

Rank	Previous quarter	Country	Overall score
1	1	Norway	89.70
2	2	Switzerland	87.44
3	3	Luxembourg	87.21
4	4	Singapore	86.59
5	5	Sweden	86.41
6	6	Finland	84.54
7	7	Denmark	82.49
8	8	Canada	82.45
9	11	Hong Kong	81.74
10	10	Australia	81.53
			Score out of 100.

Risk and Exposure: ST vs LT

Risk and exposure are **different** in the short/long run

As time goes by, markets provide some "natural" forms of hedge:

- **Parity relationships** hold **better** in the **long term**;
- **Overshooting** reactions tend to be gradually **reabsorbed**;
- **Economic policies** (purposely implemented to counteract FX fluctuations) become **fully effective**

How to survive the short run?

Hedging techniques

Hedge

Hedge (cover): to take steps to **isolate** assets, liabilities, or **income streams** from the consequences of changes in one or more **pre-identified** **risk factors**

Available hedging techniques

There are **several** available **hedging mechanisms**.

Widespread solutions:

1. Forwards (Lesson II)

2. Futures (Lesson IV)

3. Options (Lesson IV)

4. Borrowing and lending (Lesson III)

5. Currency of invoicing, predictive accuracy of cash flows, selection of supplying country

Hedging via the forward market

Basic rationale: buying/selling a forward contract **eliminates the uncertainty** about future exchange rate dynamics

The costs of forward hedging I

Let's define

$$\text{Expected cost of hedging} = F_{D/F} - E[(S_{D/F})]$$

Under the **risk neutrality - zero transaction costs** asspts, it must be

$$F_{D/F} = E[(S_{D/F})]$$

so that Expected cost of hedging = 0

The costs of forward hedging II

Relaxing the **risk neutrality** asspt

$$F_{D/F} - E[S_{D/F}] \neq 0$$

Risk premium

The costs of forward hedging III

Relaxing the **zero transaction costs** asspt

$$F_{D/F} - E[S_{D/F}] \neq 0$$

The *bid-ask spreads* on *forward exchange* are *larger* than those on *spot exchange* transactions.

This depends on the risk of unexpected FX rates fluctuations that might affect a (still) uncovered fwd position a bank has taken in the fulfillment of its market making obligations→ such a risk is higher in fwd mkts, due to their thinness

The costs of forward hedging IV

What about settlement risk?

The benefits of forward hedging

- Even assuming there is a risk premium to be paid for hedging, the **expected cost** of hedging is **matched** by the benefit of **eliminating uncertainty**;

- **Transaction costs** are generally quite **small**;

- Hedging tends to **reduce bankruptcy costs** as well as **refinancing costs**;

- Hedging helps **reduce the volatility of receipts**, **payments** and **profits.**

Hedging via the futures market

Basic rationale: futures hedging works very much the same as forward hedging apart from the daily marking-to-market procedure

The costs of futures hedging I

Basically related to the **marking-to-market risk**

Interest rates earned on the margin account may vary during the contract's life, so that there is no exact match with a forward contract's payoff profile

The costs of futures hedging II

Dealing with the **marking-to-market risk**

Suppose you have to buy 1mio £ sometime into the future and assume further that $E[S_{\$/£}]=1.5_{\$/£}$. At maturity:

Forward	Futures
Assuming $S_{\$/£}$ turns out to be $1.7_{\$/£}$, you pay only 1.5 mio \$, thus realizing a 0.2 mio \$ gain	Assuming $S_{\$/£}$ turns out to be $1.7_{\$/£}$, you still have to pay 1.7 mio \$ to purchase GBP. However, considering the (**approximate**) 0.2 mio \$ gain on the margin account, you end up paying **roughly** 1.5 mio\$→ marking to mkt risk

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How does futures hedging work? I

A US firm exports extensively to the UK and it is hence vulnerable to fluctuations in the $/£ exchange rate.

The American company fears that next quarter the pound will depreciate (from 1.50 $/£ to 1.40 $/£), thus bringing about a significant profit reduction (estimate: - 200,000$).

The firm consequently decides to sell pounds in the futures market, so as to offset the exposure to exchange rate fluctuations…

How does futures hedging work? II

How many pounds does the company have to sell?

$$\frac{200{,}000\$}{(1.50\frac{\$}{£} - 1.40\frac{\$}{£})} = 2{,}000{,}000£$$

Given that each pound futures contract on the CME calls for delivery of 62,500£, **how many contracts** should the company short (sell)?

$$\frac{2{,}000{,}000£}{62{,}500£} = 32$$

HEDGE RATIO

Hedging through options

Basic rationale: buying a call (put) option allows you to put a cap (floor) on the amount to be paid (received) in the future, while granting you a further chance of benefiting from the exchange rate ending up below (above) the strike price

The costs of option hedging

Options give their holder the possibility, **<u>NOT the obligation</u>**, of buying or selling

Very desirable feature that generally implies a **higher purchasing cost** if compared to forward and futures

Watch out

The choice among options with different strike prices depends on whether the hedger wants to insure **only** against **very bad** outcomes for a cheap option premium (by using an out-of-the money option) **or** against **anything other than very good outcomes** (by using an in-the-money option).

Option hedging strategies I

Straddle

A **long (short) straddle** is obtained by **purchasing (selling)** both a **call and a put option** with identical strike price and maturity.

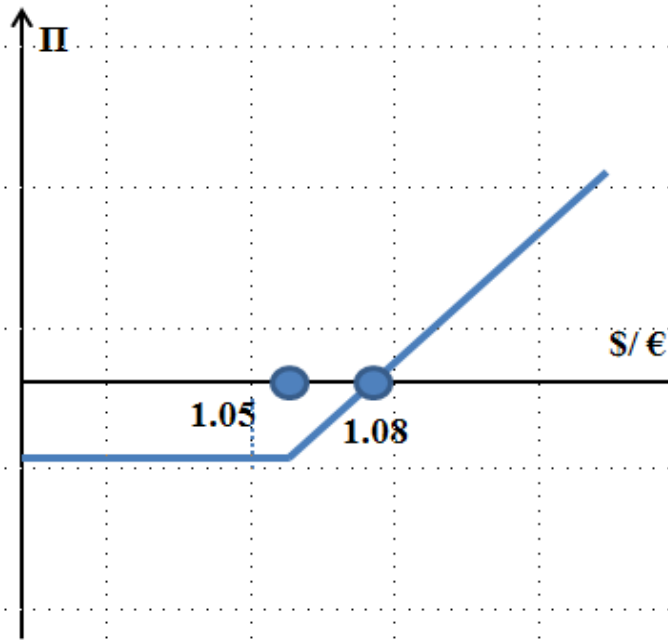# Option hedging strategies II

Assume that:

- Call Premium = $ .03
- Put Premium = $ .02
- Strike Price = $/€ 1.05
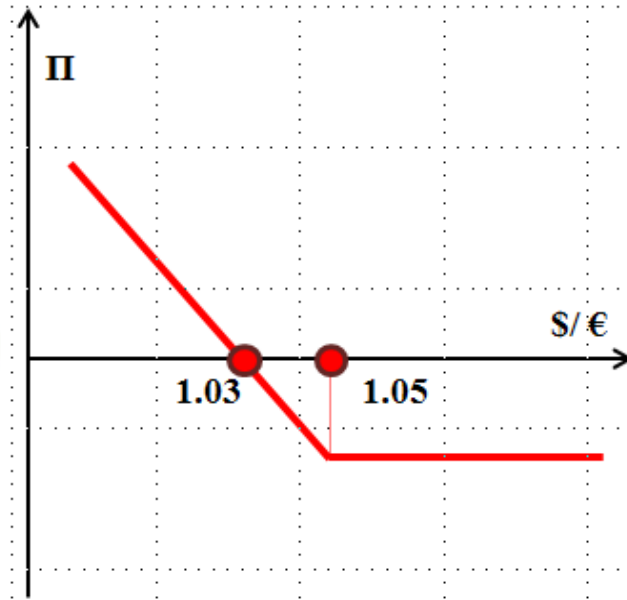- Each option contract represents € 62,500

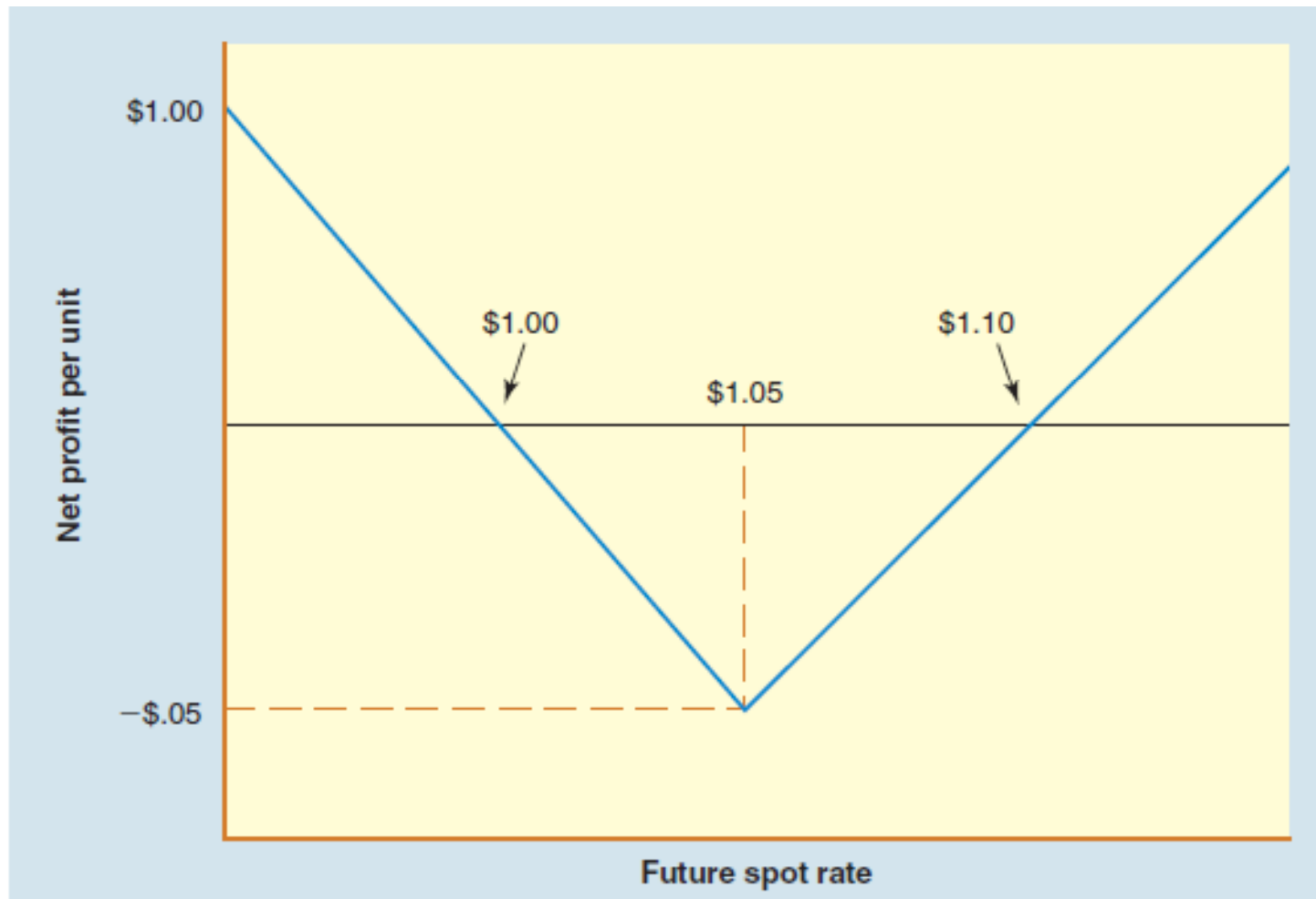Can you determine the payoff chart?

Option hedging strategies III

Call Payoff Diagram
Put Payoff Diagram

$S/€$
$S/€$

1.05
1.08
1.03
1.05

Option hedging strategies IV

Option hedging strategies V

A long straddle allows you to hedge against **extreme** market movements.

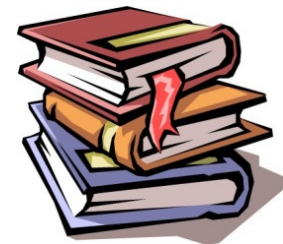Notice, though, that it is quite **expensive**, as it involves the simultaneous purchase of two separate options (option premia)

Option hedging strategies VI

Strangle

A **long (short) strangle** is obtained by **purchasing (selling)** both a **call and a put option** with identical maturity, but different strike prices (most common type of strangle: $K_{PUT} < K_{CALL}$).
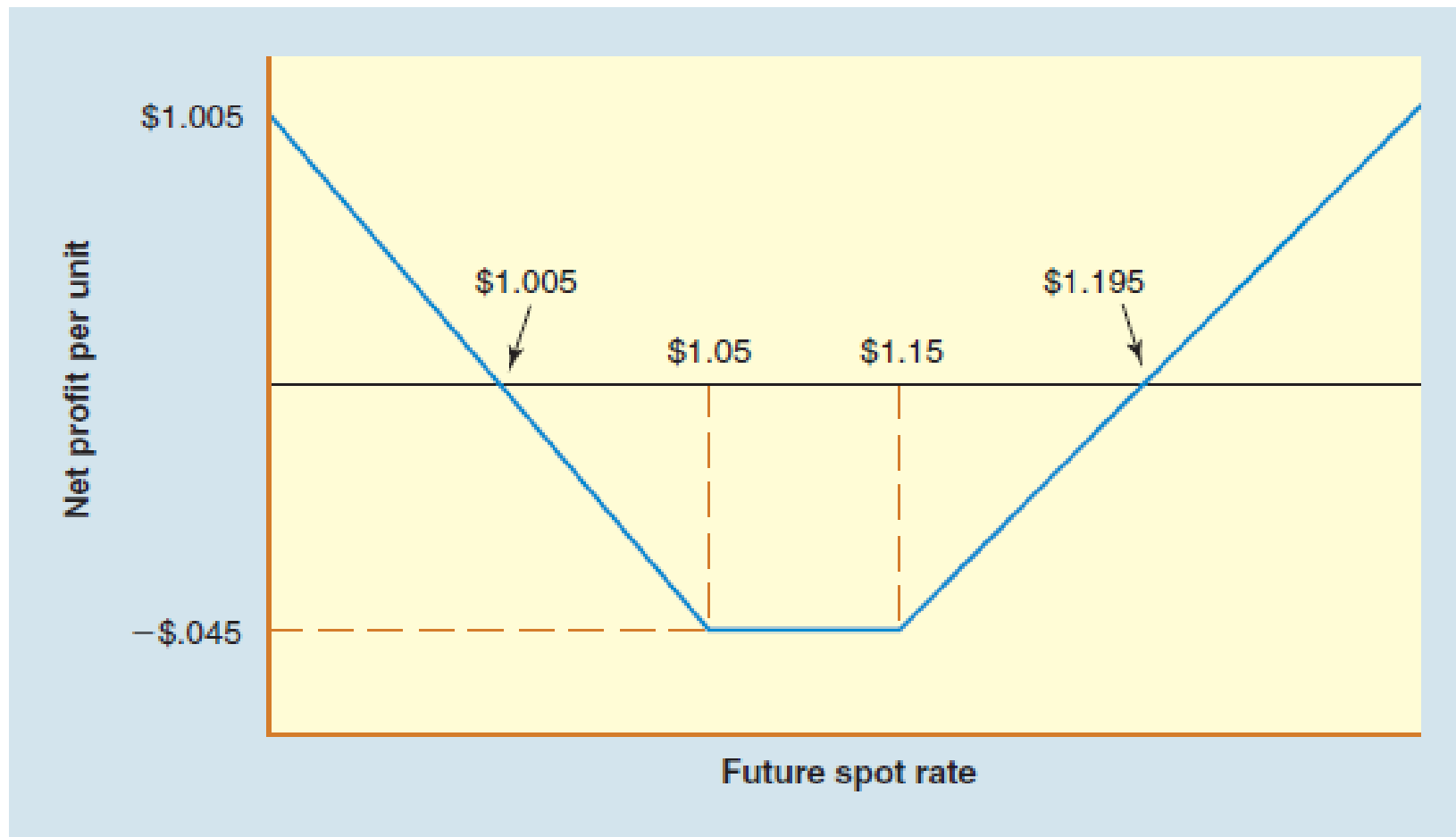
Option hedging strategies VII

Assume that:

- Call Premium = $ .025

- Put Premium = $ .02

- Call Option Strike Price = $/€ 1.15

- Put Option Strike Price = $/€ 1.05

- Each option contract represents € 62,500

Can you determine the payoff chart?

Option hedging strategies VIII

Source: Madura, International Financial Management, 2007, Thomson South-Western

Option hedging strategies IX

A long strangle allows you to hedge against even more **extreme** market movements (if compared to a long straddle).

However, it is generally **cheaper** (could you explain why?)

Hedging via borrowing and lending

Basic rationale: if we combine the spot exchange rate with borrowing and lending, we can replicate a fwd's payoff profile (CIRP)

The costs of borrowing and lending

Hedging with borrowing and lending is generally more expensive than hedging with a forward contract

- Bid-ask spread on the spot FX rate
- Borrowing-investment spread on the interest rates

Hedging against country risk I

There are no precise hedging mechanisms to avoid country risk

Most of the available options are just strategic business choices that can help eliminate/reduce country exposure

Hedging against country risk II

- Keeping control of key corporate operations;
- Planned divestments;
- Joint Ventures;
- Local debt;
- Investment "insurances"

Hedging against country risk III

Keeping control of key corporate operations

Domestic investors try to maintain full control of crucial activities and, more generally, take steps to prevent key operations from being able to run without their cooperation

Planned divestments

The owner of an FDI can agree to turn over ownership and control to local people at a specific time in the future

Hedging against country risk IV

Joint Ventures

Shared ownership of an investment, instituted because of the need for a large amount of capital or to reduce the risk of confiscation or expropriation.

Local debt

The risk of expropriation or confiscation can be significantly reduced by borrowing within the country where the investment occurs→ notice, however, that the higher the country risk, the less developed the domestic K mkts

Hedging against country risk V

Investment "insurances"

- Many countries will insure their companies that invest overseas against losses from political events (currency inconvertibility, expropriation, war, revolution...)

- CDS = derivative instrument that "insures against losses stemming from a credit event. In the context of countries, the contract protects against the default of the issuing sovereign. The premium (spread) which the protection buyer (e.g. a bank) pays to the protection seller (e.g. an insurance company) is determined by market forces and depends on the expected default risk of the respective country" (www.dbresearch.com).
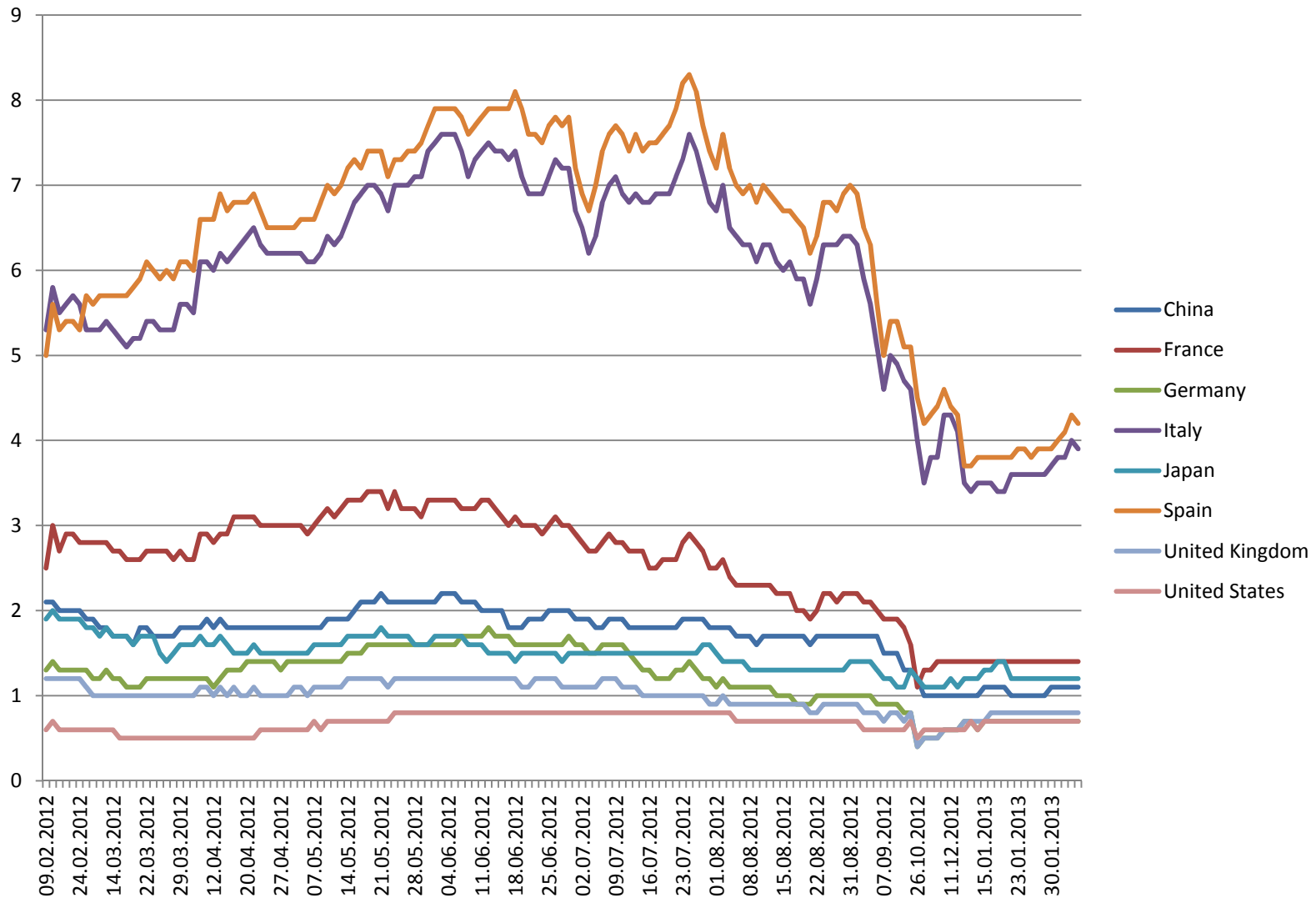
Country risk and CDS

In practice, a CDS is an **indicator** of the market's current **perception of sovereign risk**.

CDS and Annual P(default)

To put it into practice I

- A US investor buys a USD-denominated bond. Does he have to face any FX exposure? Why? Please, explain.

- The treasurer of the XYZ company based in Country 1 is expecting a dividend payment of 10 mio Currency 2 from a subsidiary located in Country 2 in two months. His/her expectations of the future Currency 1/ Currency 2 spot rate are mixed: Currency 2 could strengthen or stay flat over the next two months. The current exchange rate is Currency 1 0.63/Currency2. The two-month futures rate is at Currency 1 0.6279/Currency2. The two-month Country 2 interest rate is 7.5%. The two-month Country 1 T-Bill yields 5.5%. Puts on Currency 2 with maturity of two months and strike price of Currency 1 0.63/Currency2 are traded on the CME at Currency 1 0.0128. Compare the following choices offered to the Treasurer:

To put it into practice II

I. Sell a futures on Currency 2 for delivery in two months for a total amount of 10 mio Currency 2.

II. Buy 80 put options on the CME with expiration in two months and strike price equal to the current price (Assume that 1 put option is for 125000 Currency 2).

III. Set up a forward contract with the firm's bank XYZ

A. What is the respective cost of each strategy?

B. Which strategy would best fit the treasurer's mixed forecast for the future spot rate of Currency 2?

To put it into practice III

- Consider the following option strategy, involving the simultaneous sale of two different options (call and put, same maturity, same strike):

  Call option premium: $ .01

  Put option premium: $ .015

  Strike: $/£ 1.35

  Each option calls for the delivery of £ 45,500

  a. Draw the payoff profile.

  b. Would you use the foregoing option strategy to hedge against small market movements? Why?