

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: sensitivity of changes in the real domestic currency value of assets and liabilities to changes in exchange rates.

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

Foreign exchange exposure II

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



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...)



Finding the FX exposure on contractual assets/liabilities

Suppose:

- €-denominated bank account = €1,000
- $S_{\$/\epsilon}$ from $1.1_{\$/\epsilon}$ to $1.2_{\$/\epsilon}$

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

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...)

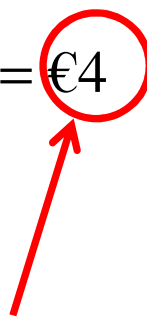


Finding the FX exposure on non contractual assets/liabilities I

Suppose:

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

Finding the FX exposure on non contractual assets/liabilities II

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


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 non contractual assets and liabilities



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

Foreign currency-denominated bonds and FX exposure I

Suppose:

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

Foreign currency-denominated bonds and FX exposure II

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



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

Foreign currency-denominated bonds and 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”

Operating exposure: the effects of exchange rates on exporters

Exporters

- After devaluation (and assuming non-tradable inputs), export prices (expressed in home currency terms)↑, export volumes↑, total revenues (in domestic currency) ↑→ **short run implications**;
- The entry of new firms and/or the general inflation brought about by devaluation gradually erode the increased profits→ **long run implications**

Would these conclusions remain unchanged if inputs were tradable?

Operating exposure: the effects of exchange rates on importers

Importers

- After devaluation, import prices rise while the overall quantity of imports falls. This causes a decline in profits.

What if there were an appreciation?

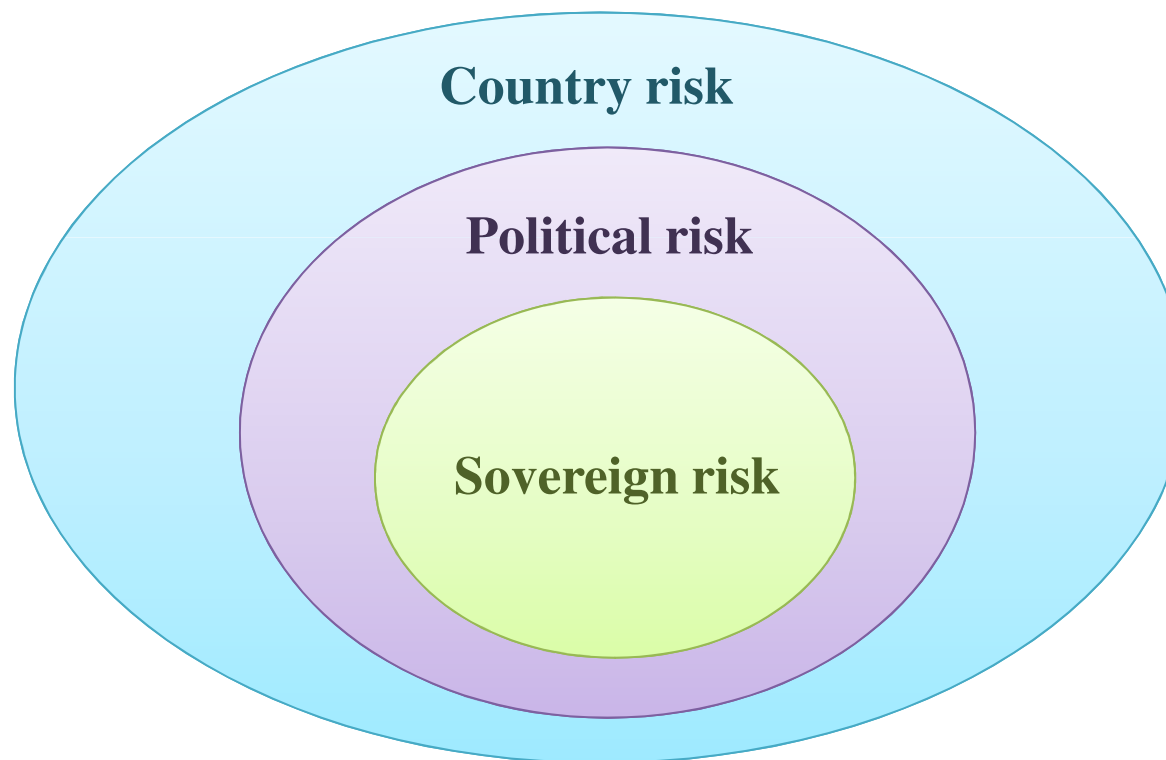
Country risk I

Country risk: possibility of losses due to country-specific economic, political and social events



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 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...)

Country risk V

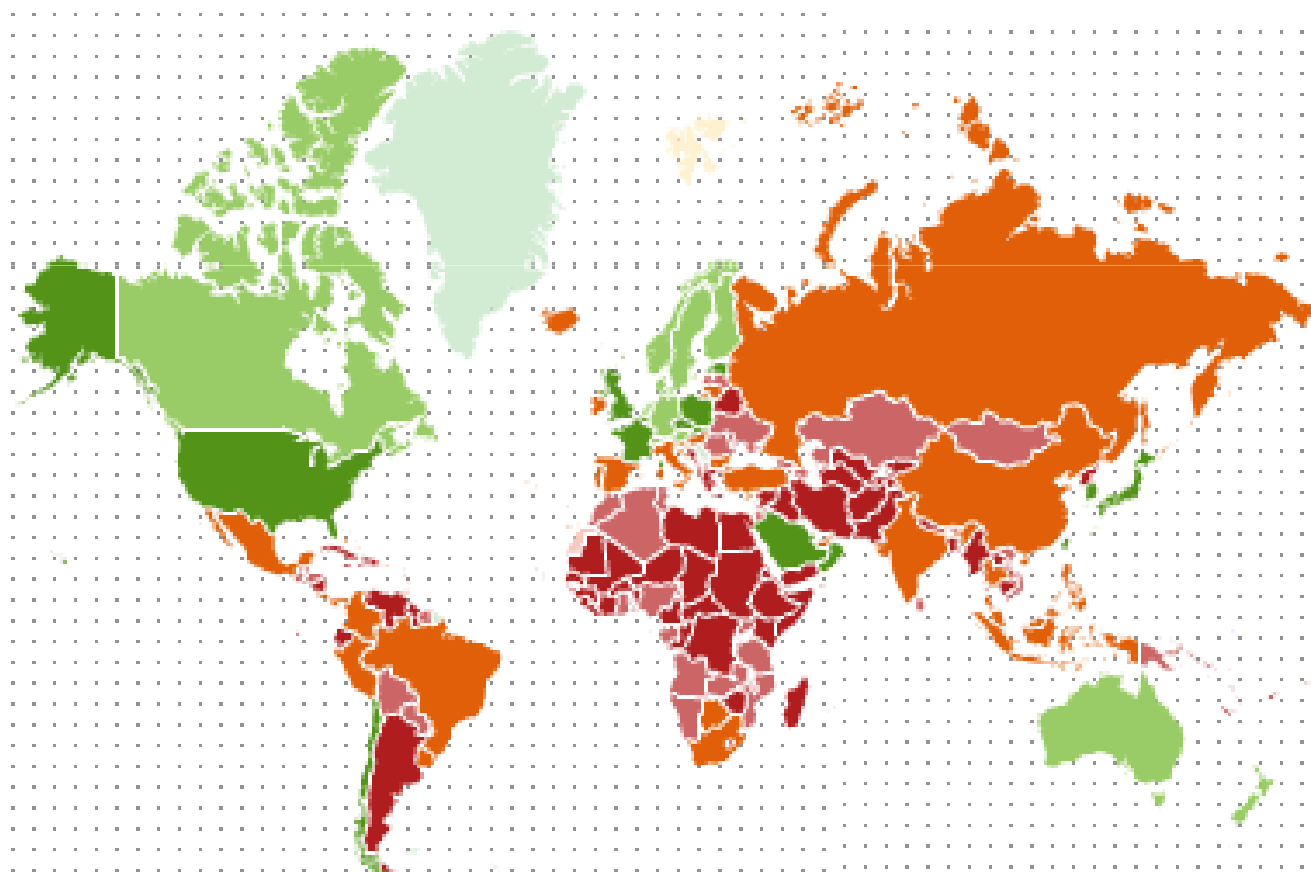
Euromoney's country risk rating scheme



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).

Euromoney's country risk rankings 2012 I



Euromoney's country risk rankings 2012 II



World risk average

Score	41.89		+0.16 ▲
Economic assessment	43.88	+0.01 ▲	
Political assessment	45.82	-0.05 ▼	
Structural assessment	38.51	+0.23 ▲	
Access to capital	38.64	+1.71 ▲	
Credit ratings	31.84	-0.23 ▼	
Debt indicators	40.64	0.00 ►	



Country movers

 Less risk

 More risk

Slovenia	61.26	-4.04 ▼
Burundi	3.61	-4.00 ▼
Seychelles	38.94	-3.33 ▼
Kazakhstan	45.54	-3.17 ▼
Chad	12.00	-2.52 ▼

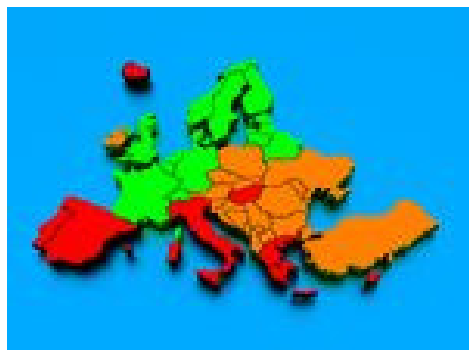
Country movers

 Less risk

 More risk

Bhutan	23.96	+10.71 ▲
Barbados	51.50	+7.57 ▲
Samoa	18.88	+3.50 ▲
Fiji	17.53	+3.00 ▲
Ghana	44.75	+3.00 ▲

Euromoney's country risk rankings 2012 III



Eurozone country risk scores: No longer in free fall

Country	ECR Rank Q1 2012	ECR Score Q1 2012	Rank change in Q1	Rank change since March 2010
Finland	5	85.3	1	0
Netherlands	9	83.8	-1	0
Germany	13	81.9	0	-2
Austria	14	81.2	0	-7
France	18	75.1	-1	-6
Belgium	21	71.8	0	-7
Italy	36	63.2	1	-12
Spain	39	61.8	1	-14
Ireland	48	57.3	-2	-27
Portugal	61	52.2	0	-30
Greece	120	33.1	-5	-87

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 hedging¹

- 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**.

1. Please, notice this will hold as well for all the other hedging techniques

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 $E[S_{\$/\pounds}] = 1.5_{\$/\pounds}$. At maturity:

Forward	Futures
Assuming $S_{\$/\pounds}$ turns out to be $1.7_{\$/\pounds}$, you pay only 1.5 mio \$, thus realizing a 0.2 mio \$ gain	Assuming $S_{\$/\pounds}$ turns out to be $1.7_{\$/\pounds}$, 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

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?

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



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

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

HEDGE RATIO



Hedging via the option market

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, **NOT the obligation**, 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:

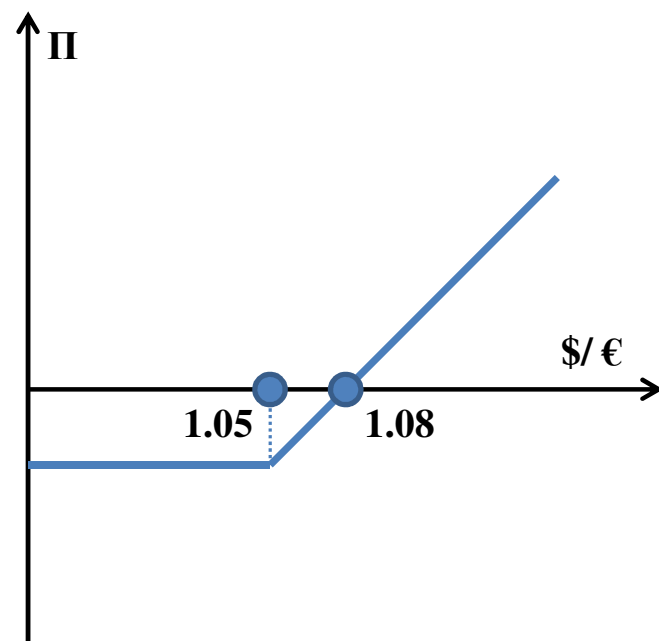
- Call Premium = \$.03
- Put Premium = \$.02
- Strike Price = \$/€ 1.05
- Each option contract represents € 62,500

Can you determine the payoff chart?

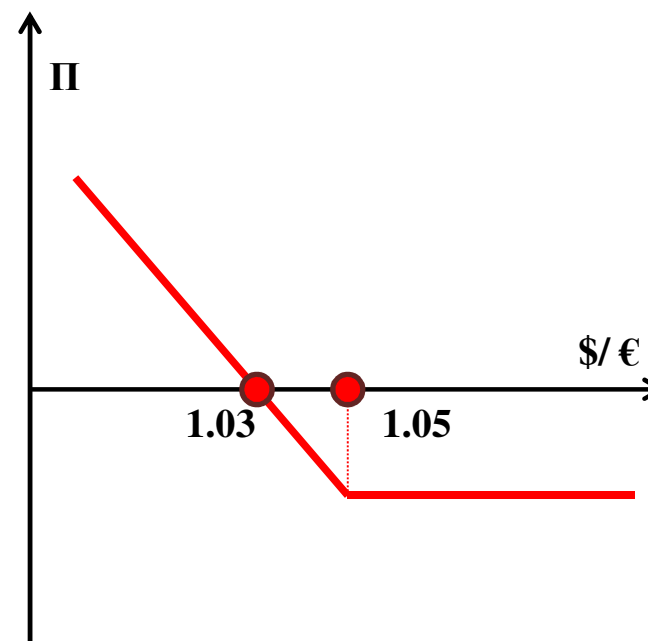


Option hedging strategies III

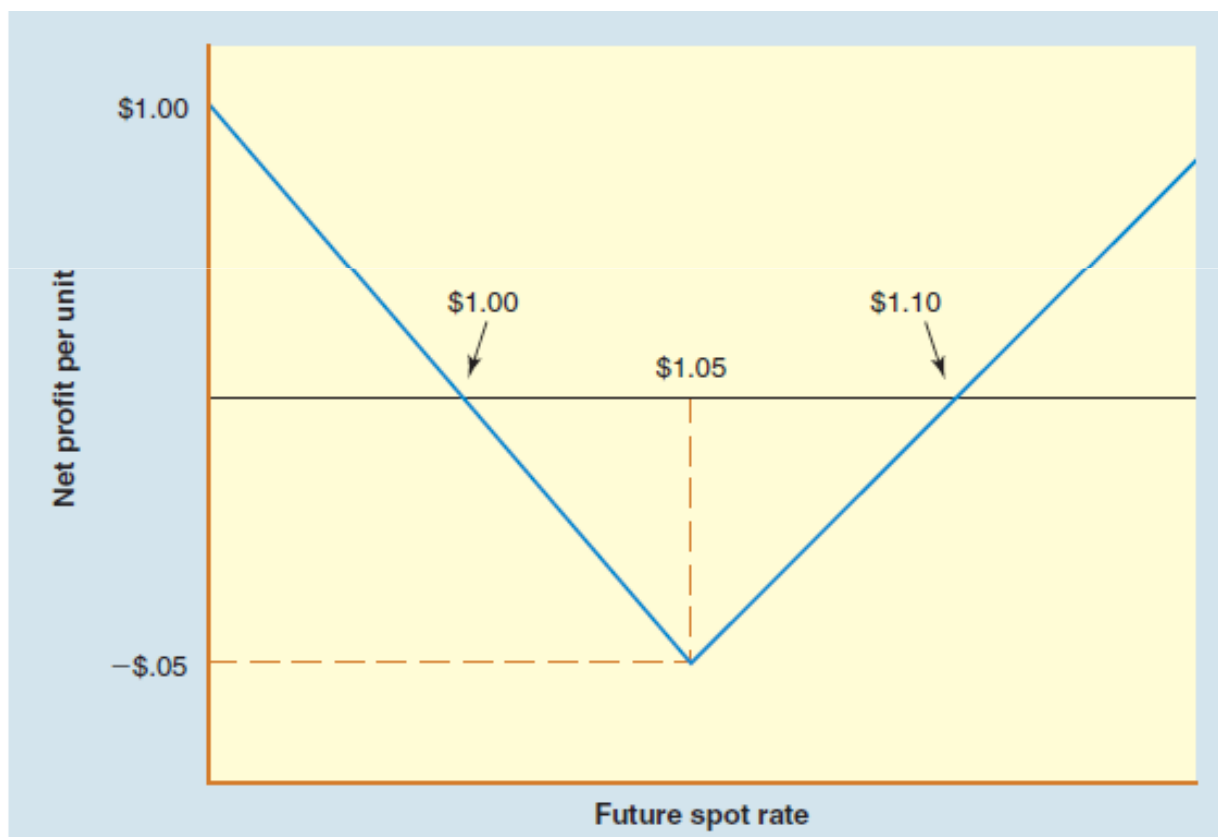
Call Payoff Diagram



Put Payoff Diagram



Option hedging strategies IV



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

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: $K_{\text{PUT}} < K_{\text{CALL}}$).



Option hedging strategies VII

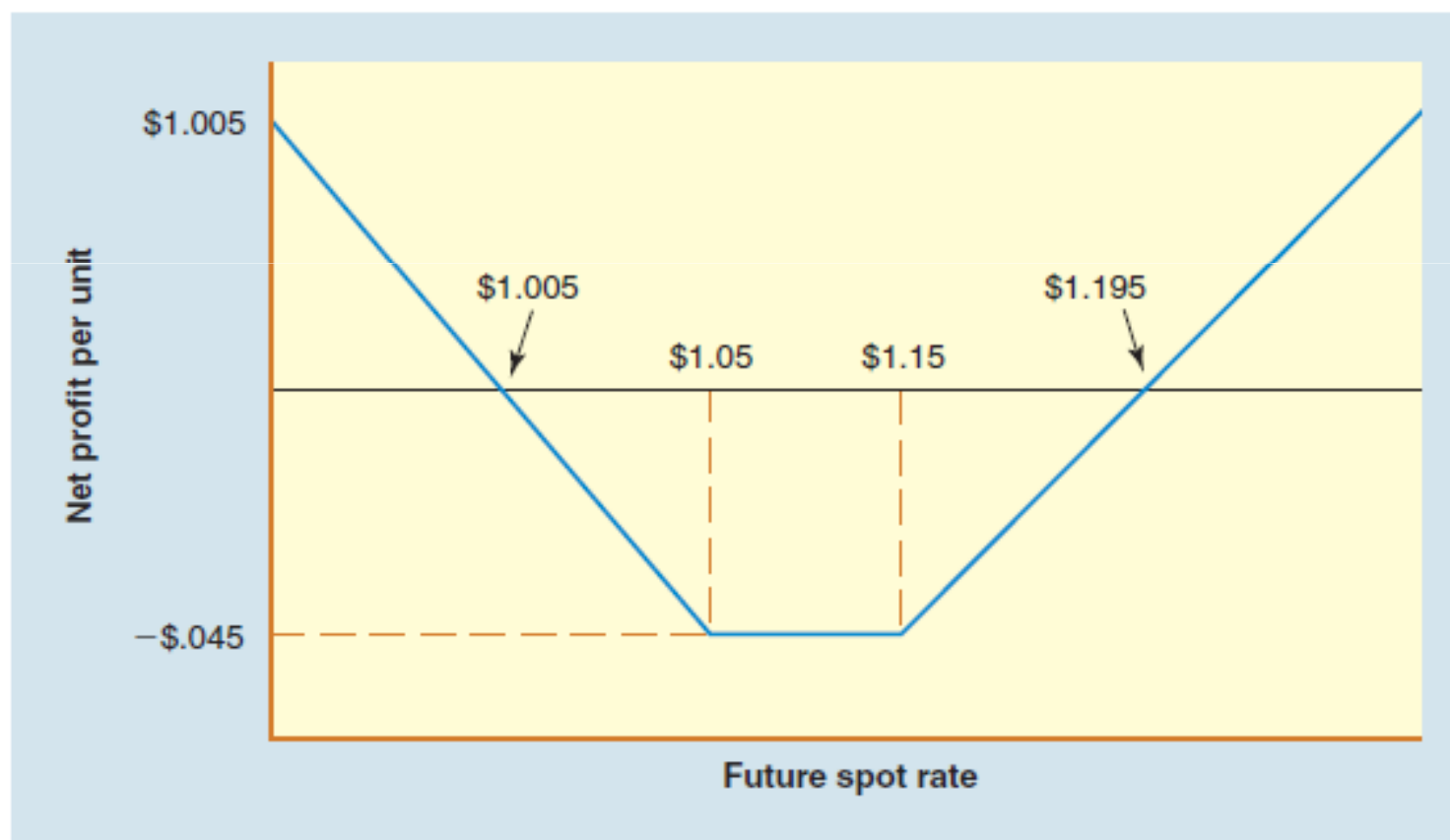
Assume that:

- 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

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”

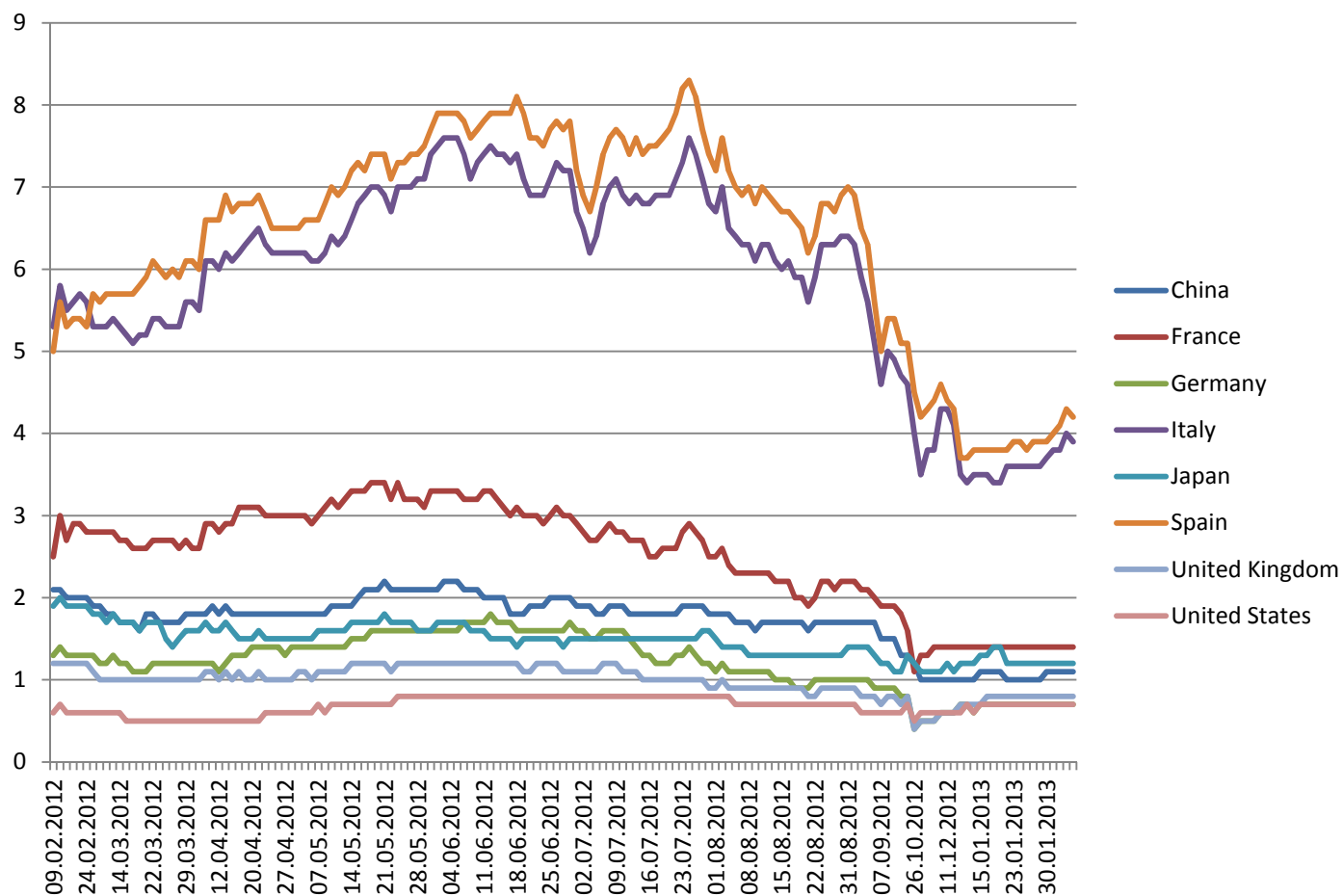
- Many countries will insure their companies that invest overseas against losses from political events (currency inconvertibility, expropriation, war, revolution...)
- CDS = derivative instrument that “insures against losses stemming from a credit event. In the context of countries, the contract protects 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 probability of 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?