Lesson IX: Working within an International Context - Risks, Exposures and Hedging Techniques

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What is Risk Management?

Risk Management can be defined as the process of identifying, asessing and preparing responses (i.e. managing) one or more risk factors.

Watch out: Risk vs Exposure

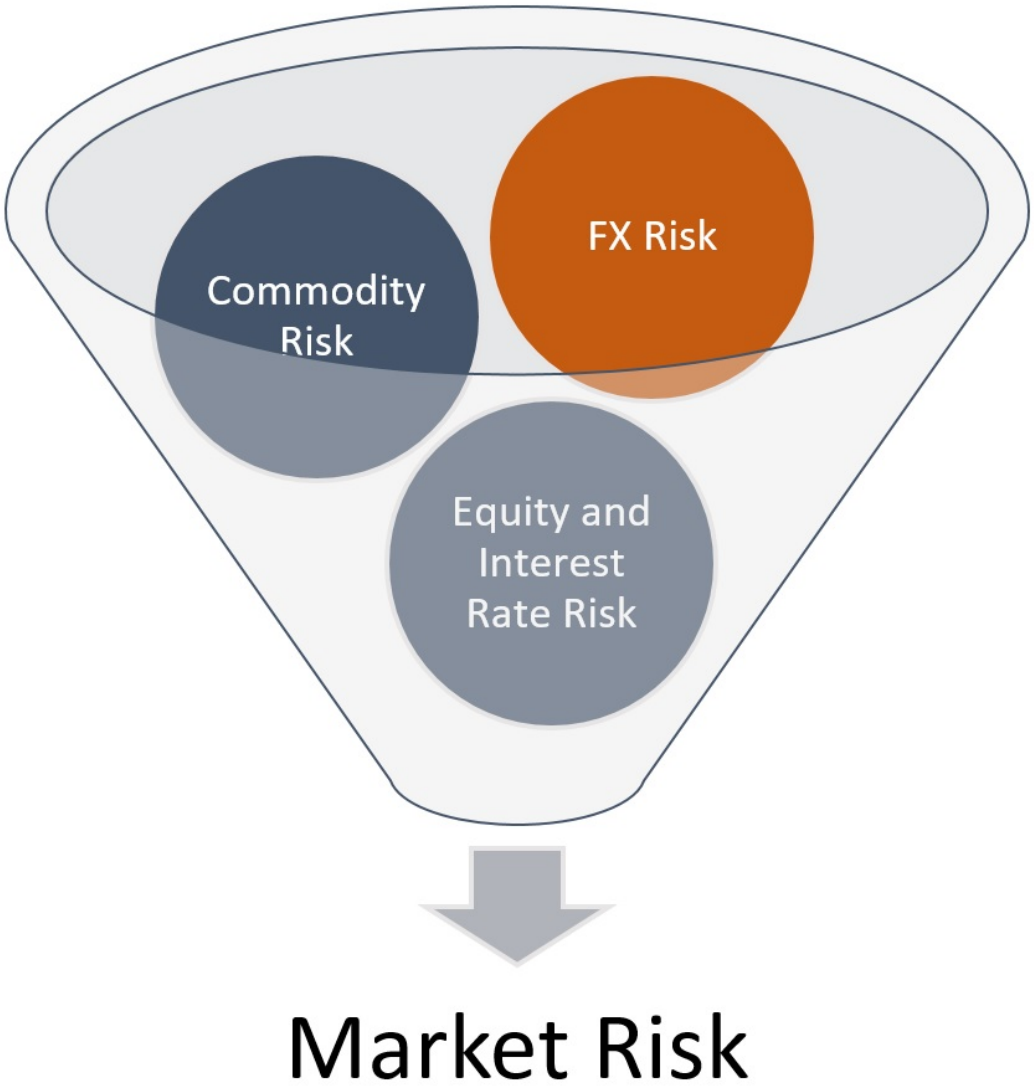
- **Risk** is an uncertain event that might occur in the future; it relates to the **variability in the values** of assets and liabilities, due to unexpected events and occurrences.
- **Exposure** is the **amount at risk** (measured in **monetary terms**).

Main Categories of Risk

Risk can be broadly categorized into one of the following:

- **Credit Risk**: risk of loss due to the failure of a borrower or counterparty to fulfil his contractual obligations
- **Settlement Risk**: risk that the counterparty will fail to deliver the terms of a contract (security or cash) with another party at the time of settlement
- **Market Risk**: risk of loss due to factors that affect market prices
- **Operating**(including business, legal and reputational risks): risk of losses incurred for inadequate or failed internal processes, people, systems and/or external events
- **Country Risk**: possibility of losses due to country-specific economic, political and social events

A Deeper Insight into Market Risk



FX Risk

FX Risk: variability in the domestic currency value of assets and liabilities attributable to unanticipated changes in exchange rates

WATCH OUT: From a stastistical standpoint, **variability⇒standard deviation**

Operating Risk

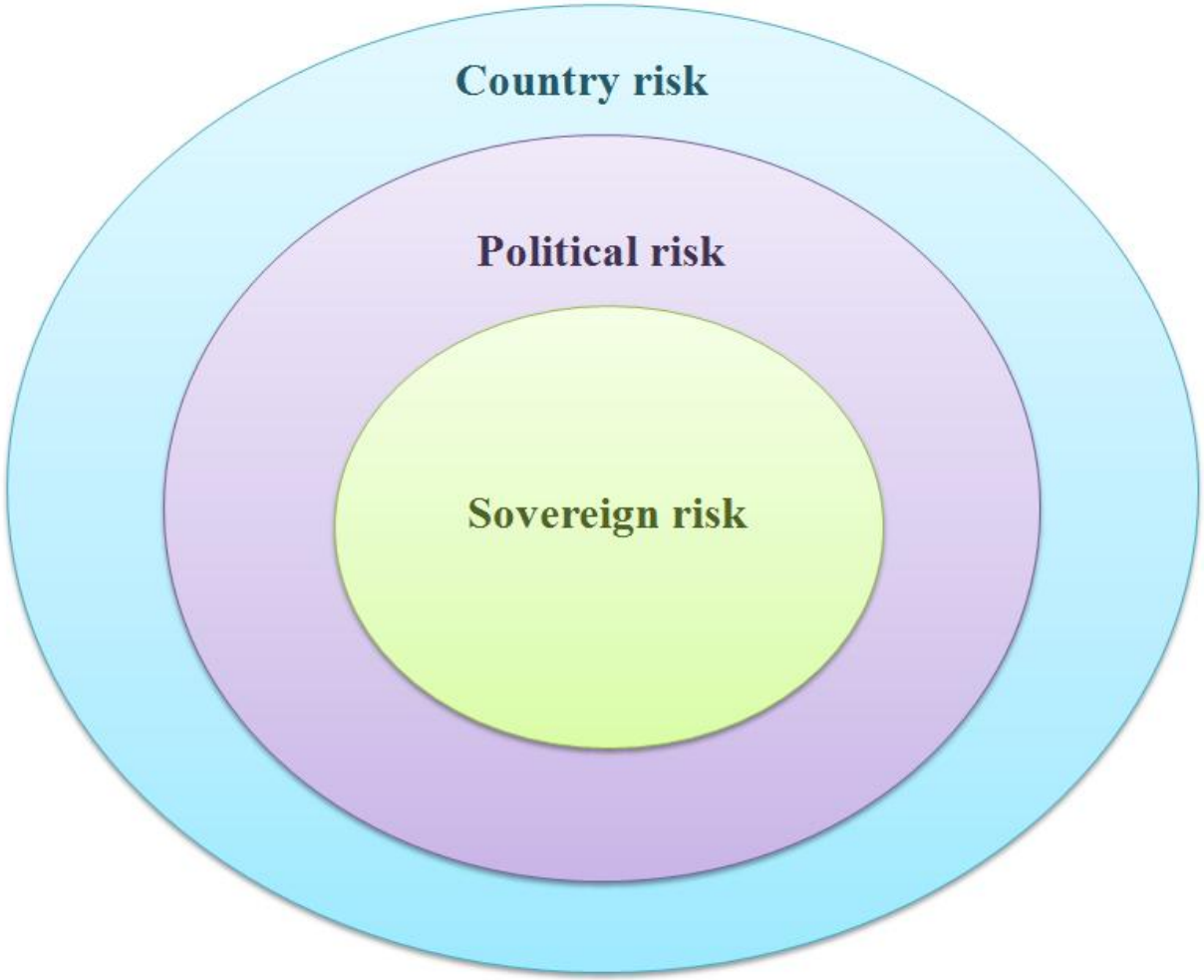
Operating risk is very difficulto to identify (and to eliminate) and thus goes under the name of **Residual Risk**.

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

Country Risk

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

In Graphical Terms...



Risk Assessment

Once identified, risks have to be prioritized, in order to focus only one those that appear to be relatively **likelier** and **more severe**.
Calculating the amounts at risk thus becomes paramount...

FX exposure

Foreign Exchange Exposure: **sensitivity** of changes in the real domestic currency value of assets and liabilities to changes in exchange rates. In more quantitative terms,

$$Exposure = \frac{\Delta V_D}{\Delta S_{\frac{D}{F}}}$$

Watch Out: Exposures are measured in monetary terms⇒ Can you find the currency of measurement? Notice, also, that **Exposure on the same asset/liability varies depending on which currency is considered as domestic/foreign**

FX Exposure on Contractual Assets: Bank Account

- EUR-denominated bank account= EUR 1,000
- $S_{\frac{USD}{EUR}}$ from 1.1 to 1.2

$$Exposure = \frac{(1.2 \cdot 1{,}000) - (1.1 \cdot 1{,}000)}{(1.2 - 1.1)} = 1{,}000 EUR$$

- Is it a long or a short exposure on EUR?
- What if we dealt with a bank loan?

FX Exposure on Non Contractual Assets: Shares

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

$$\frac{(1.2 \cdot 9.5) - (1.1 \cdot 10)}{1.2 - 1.1} = 4EUR$$

- Is the US investor long or short EUR? Why?
- The appreciation has increased the USD value of the investment, **although** part of this benefit has been eroded due to the lower firm's competitiveness in int'l mkts.

FX Exposure on Non Contractual Assets: Bonds

- Bond (initial price)= EUR 1,000
- The ECB follows a policy of "leaning against the wind"
- $S_{\frac{USD}{EUR}}$ from 1.1 to 1.2$\Rightarrow$ after the EUR appreciation, the ECB lowers the interest rates, thus forcing bonds' prices up to EUR 1,050

$$\frac{(1.2 \cdot 1{,}050) - (1.1 \cdot 1{,}000)}{(1.2 - 1.1)} = 1{,}600 EUR$$

- The exposure is **larger** than the value of the bond
- Is the US investor long or short EUR? Why?
- Does an investor buying exclusively domestic currency denominated bonds face any foreign exchange exposure? Why?

One Lesson to Learn

There might be a **non zero** foreign exchange exposure on domestic assets, while bearing **no** exposure on foreign assets.

Foreign Exchange Exposure and Parity Conditions

- **CIRP**: Suppose you bought a FC-denominated security and a fwd contract to sell FC with the same maturity. If this investment is held until expiration, will the said position bear any FX exposure? Why?
- **PPP**: Suppose that $\Delta S_{\frac{D}{F}} = \Delta P_D - \Delta P_F$ 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?

Country Risk Assessment

Country Risk Assessment: Ongoing, dynamic process, due to **ever changing** market conditions.
Three major assessment approaches:

- **Macroeconomic**: GDP growth, Inflation trends, Public Debt, Public Deficit, Unemployment, Interest Rates, Exchange Rates, BoP
- **Analytical**: Ratings (SP, Moody's, Fitch...)
- **Market-Based**: CDS prices, Sovereign Default Spread dynamics

Analytical Assessment Approach: Ratings

Rating: Synthetic evaluation of the **credit-worthiness** of a debtor

$\Downarrow$

Lower ratings mean higher default probability: **higher risk premia**

$\Downarrow$

Final Yield = Risk Free + Risk Premium

Ratings and Risk Premia - Source: Damodaran, 2011

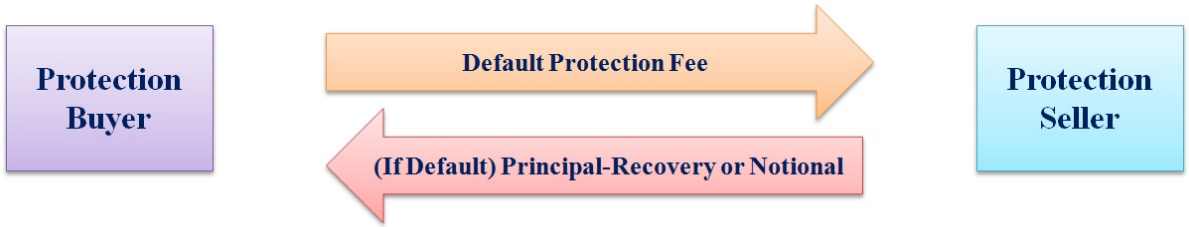
Country	Rating	Risk Premium
Brazil	Baa2	0.0263
China	Aa3	0.0105
Germany	Aaa	0.0000
Greece	Caa1	0.1050
Switzerland	Aaa	0.0000

A Real World Example: Greece - Ratings and Yields

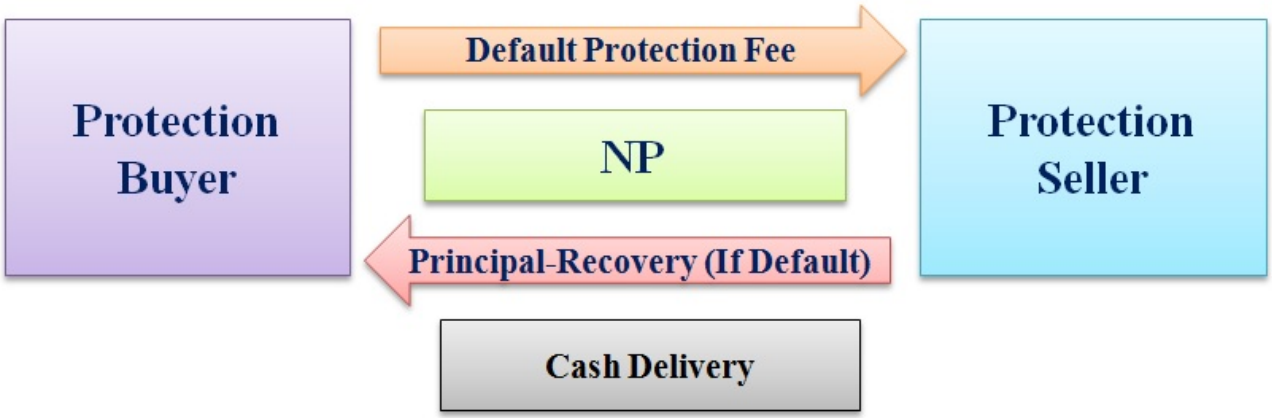
Source: Bloomberg, 10 Yrs Avg Gvt Bond Yields

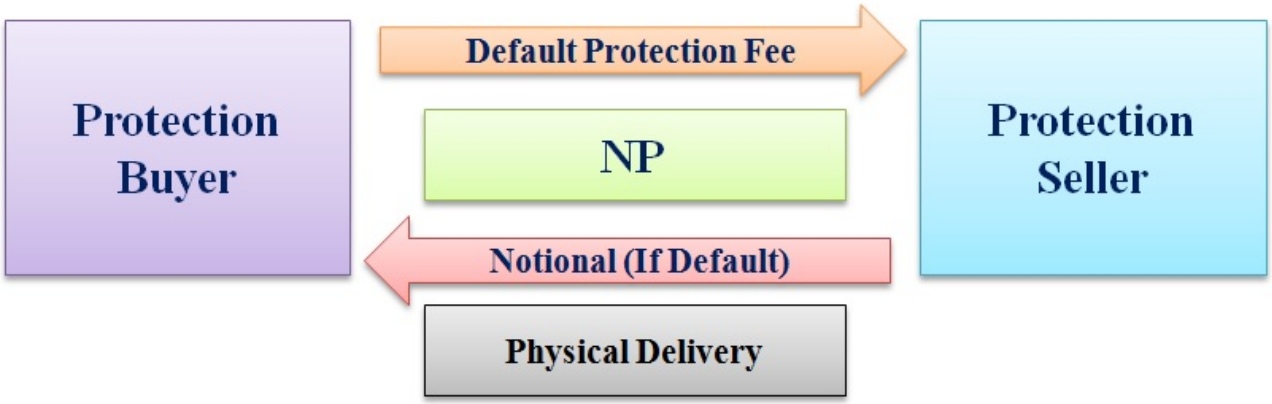
Mkt-Based Assessment Approach: CDS

CDS: Derivative instrument that **insures against losses stemming from a credit event**⇒ This contract protects against the default (credit event) of the issuer (reference entity). The premium the protection buyer pays to the protection seller is determined by market forces and depends on the expected default risk of the issuer

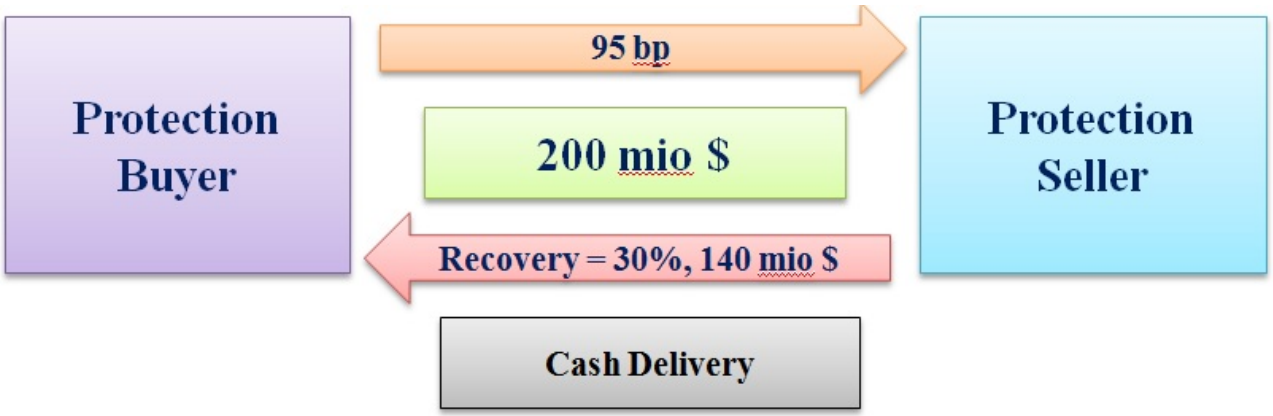


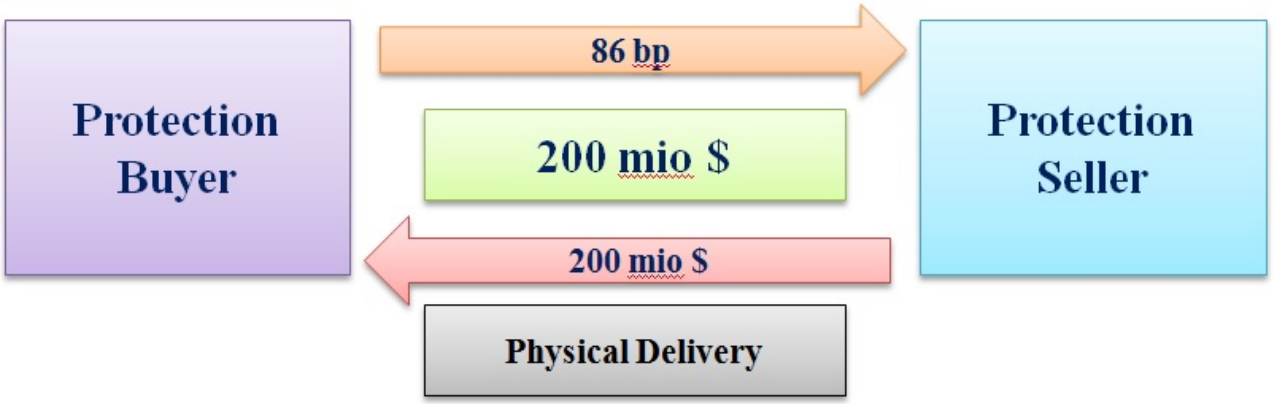
How does a CDS work? I





How does a CDS work? II





A Real World Example: Greece - Ratings and CDS

Source: Bloomberg, CDS on 10 Yrs Tenure

Mkt-Based Assessment Approach: CDS

SDS: Sovereign Default Spread, defined as

$$\text{Yield on Govt Bonds}_{t,i}\text{-Yield on Govt Bonds}_{t,j}$$

with

- **t**: generic tenure (10 yrs, 30 yrs...)
- **i**: Country under assessment
- **j**: Country perceived as substantially risk-free (USA, Germany...)

Watch Out: **Higher** spreads mean **higher** risk

BTP-BUND Spread

Source: http://countryeconomy.com/

A Wrap Up

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?

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.
Major available hedging techniques:

- Fwds and Futures
- Options
- Borrowing and Lending
- *Ad Hoc* Techniques (currency of invoicing, selection of supplying countries...)

Fwds Hedging

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

Costs of Fwds Hedging

- The **bid-ask spreads on forward transactions are larger** if compared to the spot mkt$\Rightarrow$ relatively less liquity mkt (step back to Lesson II)
- Non-zero **risk premium**

$$\text{Risk Premium} = F_{n\frac{D}{F}} - E_n[S_{\frac{D}{F}}]$$

- **No CCTP**: higher settlement risk (step back to Lesson I)

Benefits of Fwds Hedging

- **No Uncertainty** regarding future cash flows
- **Reduced bankruptcy and refinancing** costs
- **Reduced volatility** in receipts and payments flows

Futures Hedging

Basic rationale: buying/selling futures **eliminates** the uncertainty about future exchange rate dynamics (exactly as it was for fwds...)

Costs of Futures Hedging

- **Heavy standardization** (std currencies, std notional amounts, std maturities...step back to Lesson IV)$\Rightarrow$ you might be unable to achieve a perfect hedge
- **Marking-to-market risk**$\Rightarrow$ Interest rates earned on the margin account may vary during the contracts life. To make matters explicit, suppose you have to buy 1mio GBP sometime into the future and assume further that $F_{n\frac{USD}{GBB}} = 1.5$. At maturity, the future realized spot rate turns out to be $S_{\frac{USD}{GBP}} = 1.7$:
  - **Fwds**: you pay only 1.5 mio USD, thus realizing a 0.2 mio USD gain
  - **Futures**: you still have to pay 1.7 mio USD to purchase GBP. However, considering the (approximate) 0.2 mio USD gain on the margin account, you end up paying roughly 1.5 mio USD

Benefits of Futures Hedging

- **CCTP**: No settlement risk
- **Transaction costs** are relatively smaller compared to fwds
- **No Uncertainty** regarding future cash flows
- **Reduced bankruptcy and refinancing** costs
- **Reduced volatility** in receipts and payments flows

Futures Hedging: a Practical Example

A US firm exports extensively to the UK and it is hence vulnerable to fluctuations in the $\frac{USD}{GBP}$ exchange rate.
The American company fears that next quarter the pound will depreciate (from 1.50 $\frac{USD}{GBP}$ to 1.40 $\frac{USD}{GBP}$), thus bringing about a significant profit reduction (estimate: - 200,000 USD). The firm consequently decides to sell pounds in the futures market, so as to offset the exposure to exchange rate fluctuations: **How many futures should the company (short) sell**? Assume that, on the CME, each pound futures contract calls for delivery of 62,500 GBP.

$$\text{Exposure} = \frac{200{,}000}{(1.5-1.4)} = 2{,}000{,}000 \text{ GBP}$$

$$\Downarrow$$

$$\text{Nr. Futures} = \frac{2{,}000{,}000}{62{,}500} = 32 \textbf{ Hedge Ratio}$$

Options Hedging

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

Costs of Options Hedging

- **Heavy standardization** (std currencies, std notional amounts, std maturities...step back to Lesson IV)⇒ you might be unable to achieve a perfect hedge
- **Higher purchasing cost** if compared to fwds or futures⇒ Optionality is a very desirable feature
- **Margin requirements**

Benefits of Options Hedging

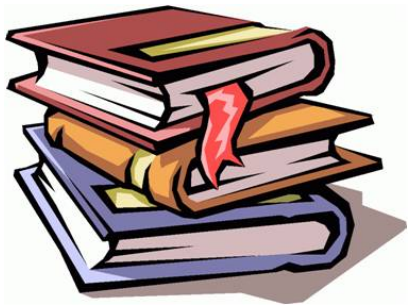
- **CCTP**: No settlement risk
- **Optionality**: you put a cap/floor to the amount to be paid/received, while still having the opportunity of benefiting from favourable mkt movements
- **Reduced bankruptcy and refinancing** costs
- **Reduced volatility** in receipts and payments flows

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: Straddles

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

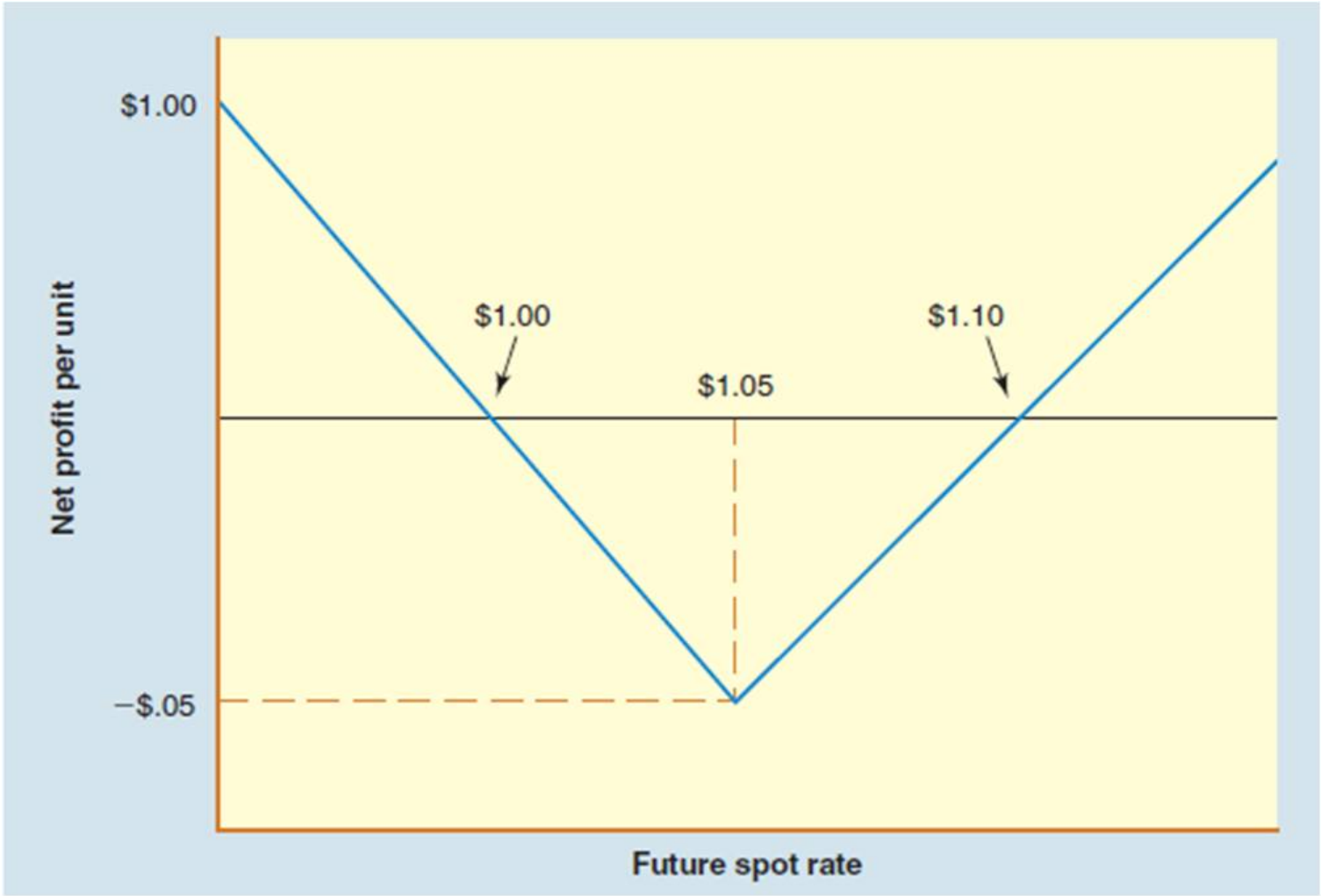


A Practical Example

Suppose that, at time t, you bought a call and a put option on $\frac{USD}{EUR}$ with the same maturity and the same strike price. Based on the info below, can you determine the payoff chart?

- Call Premium $= 0.03$ USD
- Put Premium $= 0.02$ USD
- Strike Price $= 1.05$ $\frac{USD}{EUR}$

Long Straddle Payoff Chart - Madura, 2007

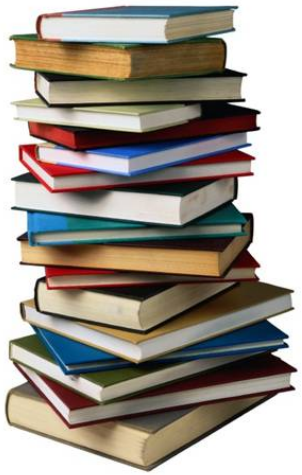


A Few Points to Bear in Mind...

- Straddles are **quite expensive**, as they involve the simultaneous purchase of two separate options (option premia)
- A **long** straddle allows you to hedge against **extreme** market movements
- A **short** straddle allows you to hedge against **relatively small** market movements

Option Hedging Strategies: Strangles

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: $K_{Put} < K_{Call}$)

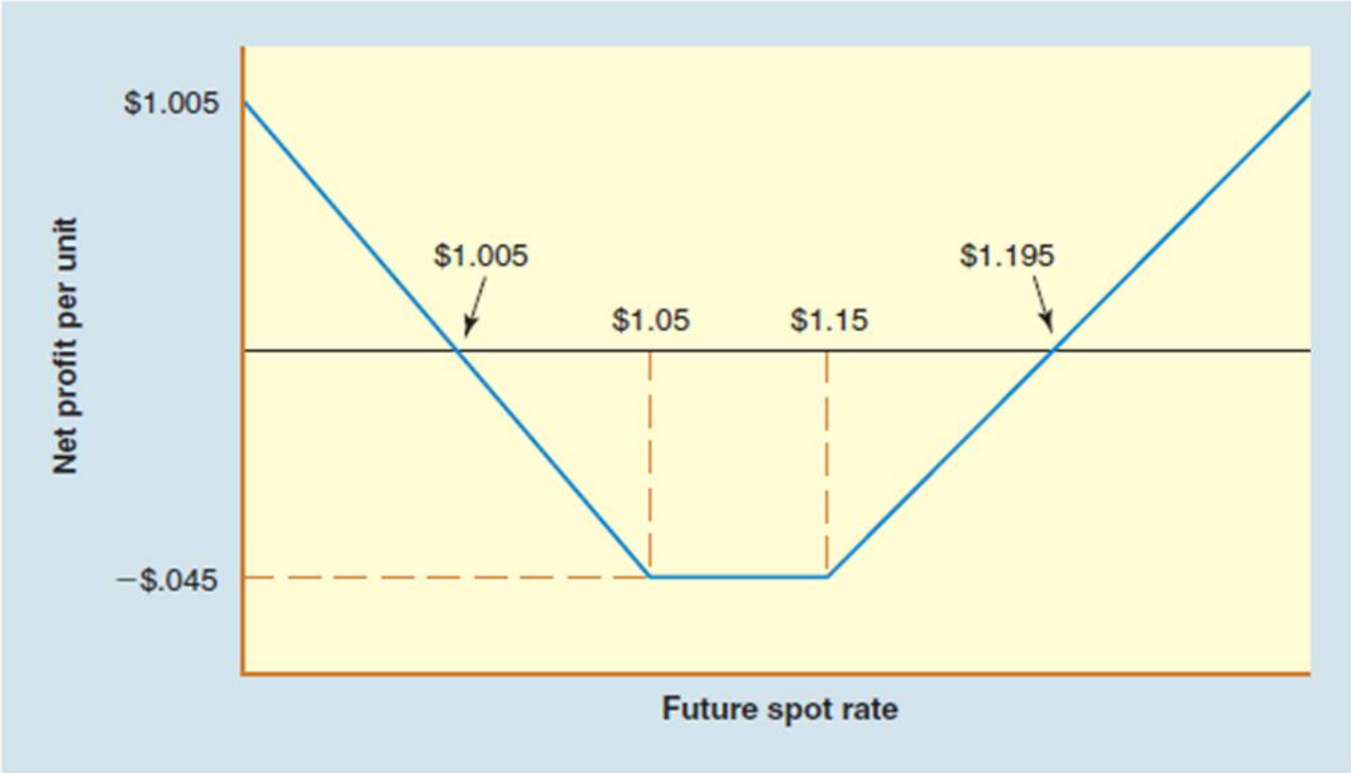


A Practical Example

Suppose that, at time t, you bought a call and a put option on $\frac{USD}{EUR}$ with the same maturity, but different strike prices. Based on the info below, can you determine the payoff chart?

- Call Premium $= 0.025$ USD
- Put Premium $= 0.02$ USD
- Call Strike Price $= 1.15$ $\frac{USD}{EUR}$
- Put Strike Price $= 1.05$ $\frac{USD}{EUR}$

Long Strangle Payoff Chart - Madura, 2007



A Few Points to Stress...

- Strangles are generally **cheaper** than straddles: could you explain why?
- A long strangle allows you to hedge against **even more extreme market movements** (if compared to a long straddle)
- What about a short strangle?

Hedging via Borrowing and Lending

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

Benefits and Costs of Hedging via Borrowing and Lending

Largerly similar to those highlighted for fwds; notice, however, that 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 Operating and Country Risk

There are **no** precise hedging mechanisms to avoid operating and country risks.
Most of the available options are just **strategic business choices** that can help eliminate/reduce the corresponding exposures.

A Few Available Techniques to Hedge against Country Risk I

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

A Few Available Techniques to Hedge against Country Risk II

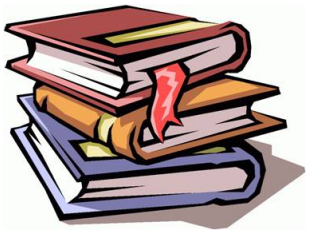
- **Local debt**: The risk of expropriation or confiscation can be significantly reduced by borrowing within the country where the investment occurs. Notice, however, that the higher the country risk, the less developed the domestic K mkts
- **Investment "insurances"**
  - Many countries will insure their companies that invest overseas against losses from political events (currency inconvertibility, expropriation, war, revolution...)
  - CDS, to be conceived as indicator of the market's current perception of sovereign risk (see above)

Long (Short) Positions

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.

Contractual vs 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...)
- **Non contractual assets and liabilities**: assets or payment obligations **without a fixed face and market values** (e.g. shares, foreign currency-denominated bonds...)



Leaning against the Wind

Leaning against the Wind: countercyclical monetary policy where central banks take action to damp down inflationary booms or to boost growth when the economy is flagging (source: FT)

Confiscation vs Expropriation

- **Confiscation**: Government takeover **without** compensation
- **Expropriation**: Government takeover **with** compensation

Sovereign vs Political Risk

- **Sovereign Risk**: possibility of losses on claims to **foreign governments or governmental agencies**
- **Political Risk**: additional possibility of losses on **private claims** (including FDIs)

To Put It into Practice I

9.1: 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 $S_{\frac{Currency1}{Currency2}}$ spot rate are mixed and thus decides to hedge, with the aim of minimizing FX risk. The current exchange rate is $S_{\frac{Currency1}{Currency2}}=0.63$. The two-month futures rate is at $F_{\frac{2}{12}\ \frac{Currency1}{Currency2}}=0.6279$. The two-month Country 2 interest rate is 0.075. The two-month Country 1 T-Bill yields 0.055. Puts on Currency 2 with maturity of two months and strike price of $K_{\frac{Currency1}{Currency2}}=0.63$ are traded on the CME at Currency 1 0.0128.

To Put It into Practice II

Compare and assess the following choices offered to the Treasurer:

- Sell a futures on Currency 2 for delivery in two months for a total amount of 10 mio Currency 2
- Buy 80 put options on the CME with expiration in two months (Assume that 1 put option is for 125000 Currency 2)
- Set up a forward contract with the firms bank XYZ

To Put It into Practice III

9.2: Consider the following option strategy, involving the simultaneous sale of two different options (call and put, same maturity, same strike):
Call option premium: USD 0.01
Put option premium: USD 0.015
Strike: $K_{\frac{USD}{GBP}}=1.35$
Each option calls for the delivery of GBP 45,500

- Draw the payoff profile
- Would you use the foregoing option strategy to hedge against small market movements Why?

To Put It into Practice IV

9.3: On 8^{th} September 201X, in order to hedge your investment portfolio, you bought 2 futures contracts for 100,000 B each @ $\frac{A}{B}$=81.5. Assume that the daily settlement prices are shown in the table below:

	8	**9**	**10**	**11**	**14**	**15**
Settlement Px	81.7	81.6	81	81.3	81	80.9

- What are the daily cash flows from marking-to-market?
- If you deposit 70,000 A into your margin account, and your broker requires 50,000 A as maintenance margin, when will you receive a margin call and how much will you have to deposit?