

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

April 20, 2016

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# 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** (measured in **monetary terms**).



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# Roadmap

Major focus on

- ▶ Foreign Exchange Rate risk and exposure
- ▶ Operating risk and exposure
- ▶ Country risk and exposure



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# Foreign Exchange Risk and Exposure

- ▶ **Foreign Exchange Risk:** standard deviation of domestic currency values of assets or liabilities attributable to unanticipated changes in exchange rate.
- ▶ **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  $\Rightarrow$   
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?



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# 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 mkt.



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# 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

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

- ▶ 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?



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# One Lesson to Learn

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



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# 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?



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# Operating Risk and Exposure

- ▶ **Operating Risk:** risk that sudden exchange rate fluctuations may **adversely affect** revenues, costs (and, consequently, profits)
- ▶ **Operating Exposure:** **sensitivity** of changes in the real domestic currency value of revenues and costs to changes in exchange rates.

**Watch Out:** Operating exposure is very difficult to eliminate and thus goes under the name of **Residual FX Exposure**

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



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# Ratings and Risk Premia - Source: Damodaran, 2011

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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

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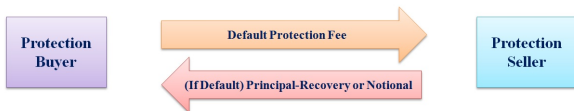
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Source: Bloomberg, 10 Yrs Avg Gvt Bond Yields

# 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



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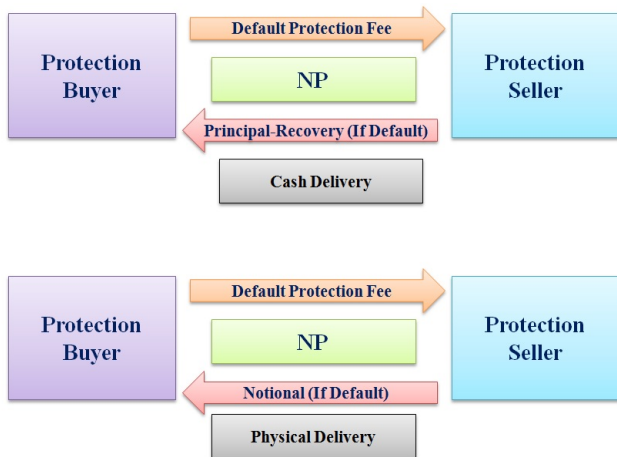
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# How does a CDS work? I



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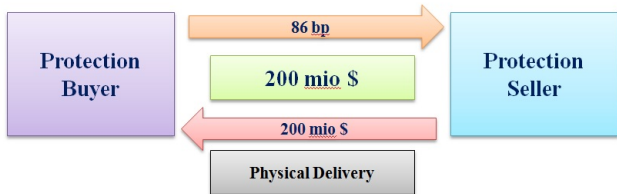
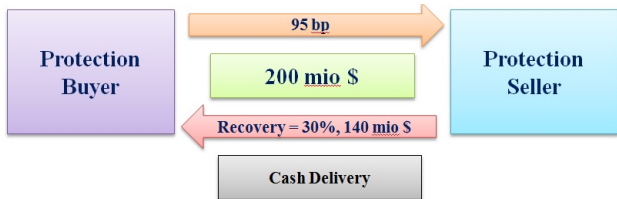
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# How does a CDS work? II



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# A Real World Example: Greece - Ratings and CDS

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Source: Bloomberg, CDS on 10 Yrs Tenure

# Mkt-Based Assessment Approach: CDS

**SDS:** Sovereign Default Spread, defined as

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

By the way, are  
risk-free countries  
truly riskless?



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# BTP-BUND Spread



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Source: <http://countryeconomy.com/>

# Risks and Exposures: 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?**



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



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# 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...)

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# Costs of Futures Hedging

- ▶ **Heavy standardization** (std currencies, std notional amounts, std maturities...step back to Lesson IV)⇒ you might be unable to achieve a perfect hedge
- ▶ **Marking-to-market risk**⇒ 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  $F_n^{\frac{USD}{GBP}} = 1.5$ . 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

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# 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.

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

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

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# 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



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# 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



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# 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).



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# 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  $\frac{USD}{EUR}$



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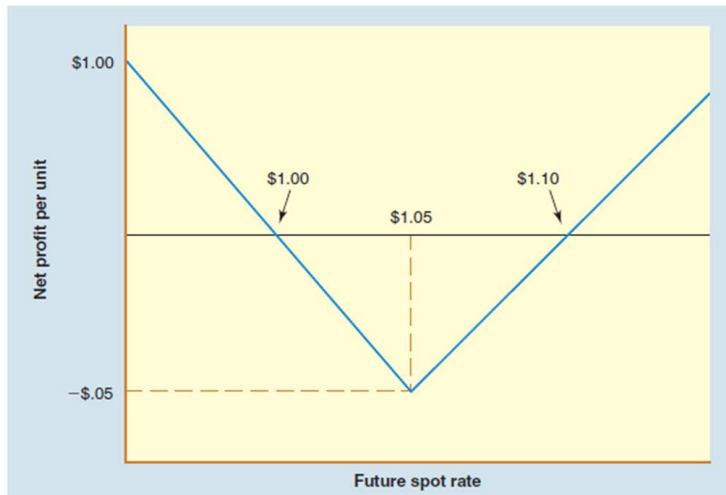
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# Long Straddle Payoff Chart - Madura, 2007



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## 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  $\frac{USD}{EUR}$



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# Long Strangle Payoff Chart - Madura, 2007

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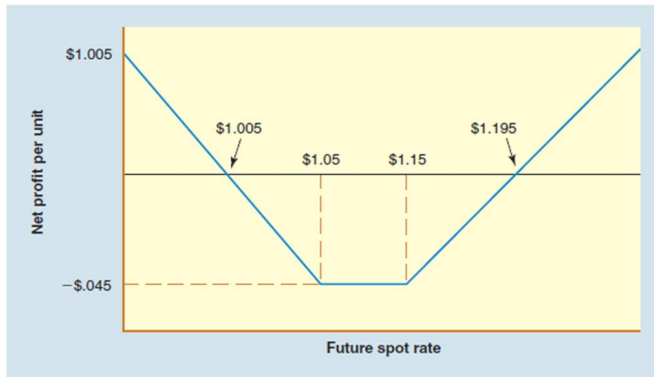
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# Hedging via Borrowing and Lending

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



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# Benefits and Costs of Hedging via Borrowing and Lending

Largely 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



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# 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

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# 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...)



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# Confiscation vs Expropriation

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





## 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  $S_{\frac{\text{Currency1}}{\text{Currency2}}}$  spot rate are mixed and thus decides to hedge, with the aim of minimizing FX risk. The current exchange rate is  $S_{\frac{\text{Currency1}}{\text{Currency2}}} = 0.63$ . The two-month futures rate is at  $F_{\frac{2}{12} \frac{\text{Currency1}}{\text{Currency2}}} = 0.6279$ . 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  $K_{\frac{\text{Currency1}}{\text{Currency2}}} = 0.63$  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



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# To Put It into Practice IV

**9.3:** On 8<sup>th</sup> 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:

	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>14</b>	<b>15</b>
<b>Settlement Px</b>	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?

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