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

Friday 27th April, 2018

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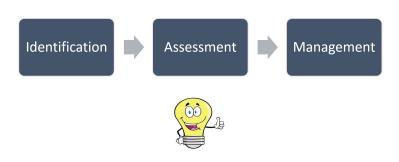
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Risk Management can be defined as the process of identifying, assessing and preparing responses to (i.e. managing) one or more risk factors.



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- 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).



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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 Risk (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

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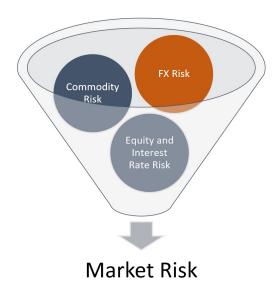
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A Deeper Insight into Market Risk



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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



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To Put It into

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



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In Graphical Terms...



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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...



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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



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FX Exposure on Contractual Assets: Bank Account

- ► EUR-denominated bank account= EUR 1,000
- \triangleright $S_{\frac{USD}{EUR}}$ 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_{USD} from 1.1 to 1.2⇒ the EUR appreciation harms the exporting company's competitiveness: the shares' price drops to EUR 9.50

$$\frac{(1.2\cdot9.5)-(1.1\cdot10)}{1.2-1.1}=4EUR$$

- ▶ 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.



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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"
- $S_{USD} \over EUR$ 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

$$\frac{(1.2\cdot1,050)-(1.1\cdot1,000)}{(1.2-1.1)}=1,600$$
 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?



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One Lesson to Learn

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To Put It into

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



- ► 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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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



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Analytical Assessment Approach: Ratings

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To Put It into Practice

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

 $\downarrow \downarrow$

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



 $Final\ Yield = Risk\ Free + Risk\ Premium$



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

Aaa



Switzerland

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A Real World Example: Greece - Ratings and Yields



Source: Bloomberg, 10 Yrs Avg Gvt Bond Yields

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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

Protection
Buyer

Default Protection Fee
Protection
Seller

(If Default) Principal-Recovery or Notional

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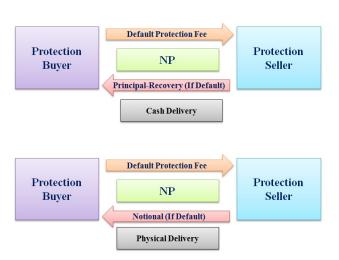
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How does a CDS work? I



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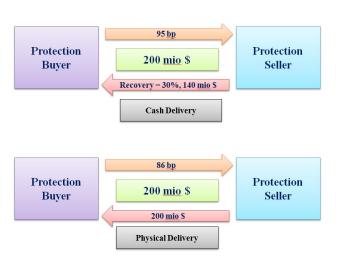
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How does a CDS work? II



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A Real World Example: Greece - Ratings and CDS



Source: Bloomberg, CDS on 10 Yrs Tenure

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To Put It into Practice

Mkt-Based Assessment Approach: CDS

SDS: Sovereign Default Spread, defined as Yield on Govt Bondst,j-Yield on Govt Bondst,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



Source: http://countryeconomy.com/

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- 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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To Put It in Practice

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...)



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Fwds Hedging

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



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

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

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



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To Put It in Practice

Benefits of Fwds Hedging

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



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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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- ► 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 $F_{n\frac{USD}{GBB}}=1.5$. 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

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To Put It into Practice

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



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Ewds and Futures



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.

Exposure=
$$\frac{200,000}{(1.5-1.4)}$$
 = 2,000,000 GBP
Nr. Futures= $\frac{2,000,000}{62,500}$ = 32 **Hedge Ratio**

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To Put It into

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



- ► 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



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- 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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To Put It int

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

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To Put It into Practice

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



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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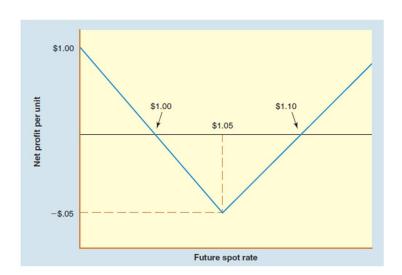
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Long Straddle Payoff Chart - Madura, 2007



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- 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



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Option Hedging Strategies: Strangles

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



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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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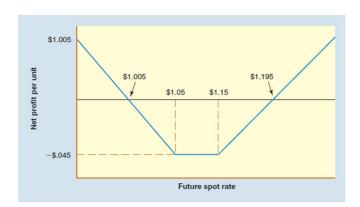
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Long Strangle Payoff Chart - Madura, 2007



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Practice Practice

- 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?



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Hedging via Borrowing and Lending

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



Borrowing and

Lending

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



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.



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- 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

- ▶ 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)



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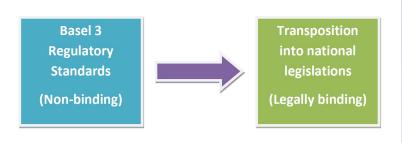
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Basel 3 is an internationally agreed set of measures developed by the Basel Committee on Banking Supervision - BCBS in response to the financial crisis of 2007-2009. These measures aim at strengething the regulation, supervision and Risk Management of financial institutions.

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The BCBS is an international Committee made up of banking Supervisory Authorities (e.g. Banque de France, Banque d'Italie, Deutsche Bundesbank...)

BCBS members are **committed to implementing and applying the said regulatory standards in their jurisdictions** within the timeframe established by the Committee.



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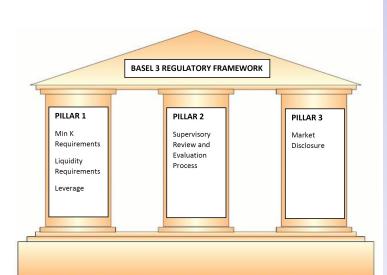
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Basel 3 Architecture

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- ▶ Pillar 1:Focus on Capital, Leverage and Liquidity
 - Sets out the rules to determine Regulatory Capital Requirements for Credit, Market, Settlement and Operating Risks
 - ► Further requirements are also established for Liquidity, Leverage and Capital Buffers
- Pillar 2: Both internal and external assessments are taken into consideration
 - Internal revision of Regulatory Capital Adequacy to assess whether additional capital is to be prudentially set aside, in excess of Pillar 1 requirements ⇒ ICAAP and ILAA
 - External assessment conducted by NSA (National Supervisory Authorities) to evaluate a financial intermediary in terms of risk management infrastructure, capital, liquidity and governance framework

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▶ Pillar 3: Disclosure requirements for financial institutions to publish information regarding their capital structure, their governance and risk management frameworks as well as their regulatory capital requirements ⇒ Market Discipline



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3 minimum thresholds (**Capital Ratios**) are to be met at all times:

CET 1 Capital Ratio

$$\frac{CET1}{RWEA} \ge 0.045 \tag{1}$$

Tier 1 Capital Ratio

$$\frac{Tier1}{RWEA} \ge 0.06 \tag{2}$$

Total Capital Ratio

$$\frac{TotK}{RWFA} \ge 0.08 \tag{3}$$

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All firm's assets are to be risk-weighted, depending on the risks they expose the financial intermediary to.

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E.g. A bond held for trading denominated in a foreign currency will have to be risk-weighted both for interest rate and for FX risks



$$RWA = \Sigma AssetValue \cdot RiskWeight \tag{4}$$

$$RWEA = RWA \cdot 12.5 \tag{5}$$

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Special Topics: A Deeper Insight into Basel III

Lecturer: Riccardo Gastaldo



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To Put It int

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.



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



Terminology

Confiscation vs Expropriation

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



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



- ► **CET 1** = "Purest" form of capital, including shares and retained earnings
- ► Tier 1 = CET 1 + Additional Tier 1
- ▶ **Total Capital** = Tier 1 + Tier 2



Terminology



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 currency1 spot rate are mixed and thus decides to hedge, with the aim of minimizing FX risk. The current exchange rate is $S_{Currency1} = 0.63$. 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 _{Currency1} = 0.63 are traded on the Currency2 CME at Currency 1 0.0128.



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- ► 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 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: $K_{\underline{USD}} = 1.35$

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?



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Practice



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?

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