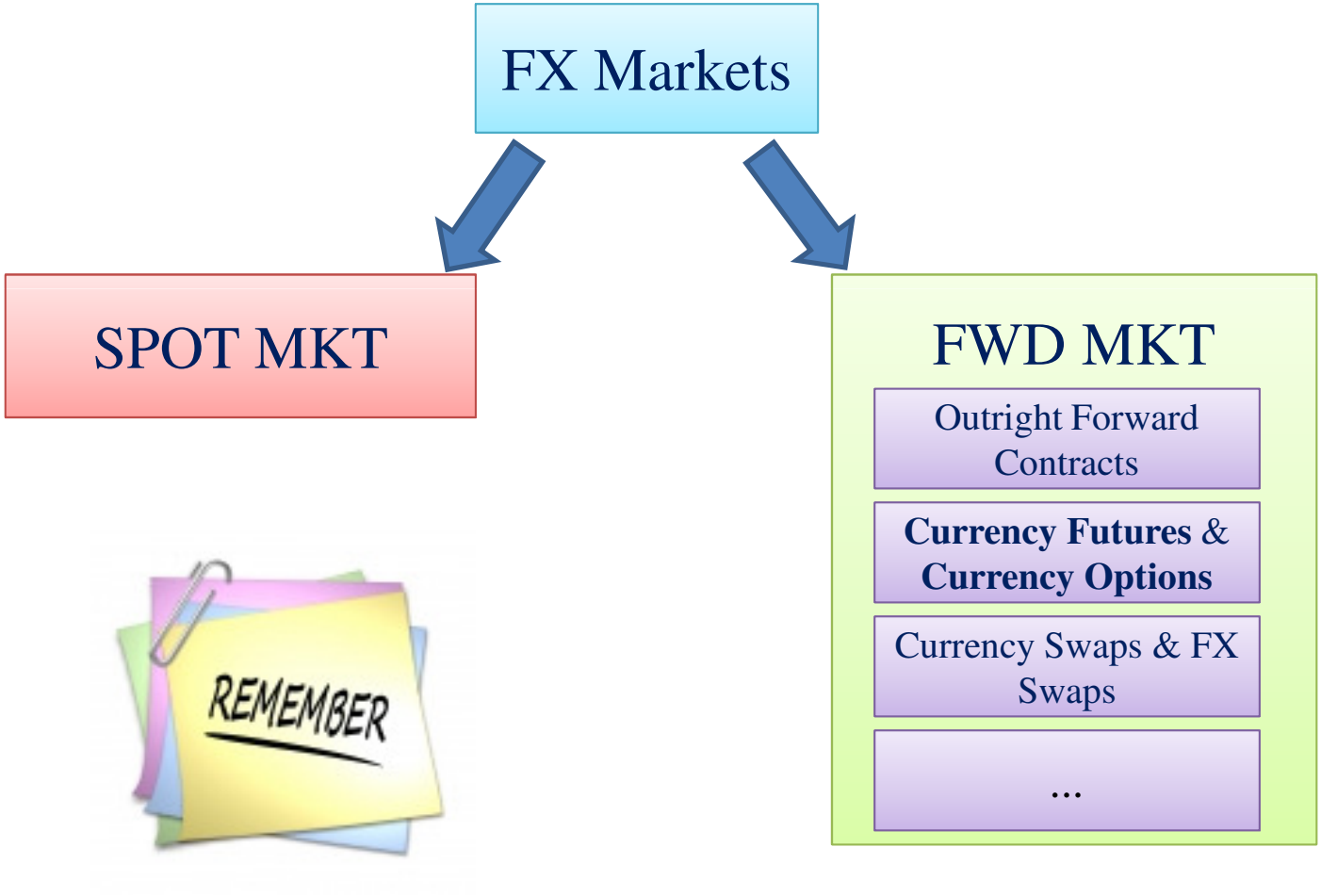
Lesson IV: Overview

LIUC
Università Cattaneo

1. Currency futures
2. Currency options
3. How to construct synthetic forwards combining call and put options

Currency Futures

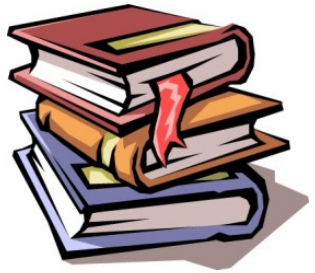
A quick recap



Currency Futures and Options

LIUC
Università Cattaneo

- **Currency Futures** are standardized contracts drawn either to buy or to sell a fixed amount of foreign currency on a pre-determined date sometime in the future.
- **Currency Options** are derivative contracts that give the buyer the opportunity to buy or to sell the underlying asset at a given price sometime in the future



Forwards vs Futures and Options

Forwards	Currency Futures & Options
Traded Over The Counter ↓ Non- standardized, "tailor-made", flexible contracts	Traded on regulated markets ↓ Highly standardized, homogeneous contracts

Flexibility vs Standardization

What is the **advantage** of **standardization** over **flexibility**?

The more homogeneous (and the fewer) are the contracts, the higher is the market depth

Terminology

OTC market

Widespread aggregation of dealers who make markets in many different securities. Unlike an exchange on which trading takes place at one physical location, OTC trading occurs through telephone or computer negotiations between buyers and sellers.

Futures vs Forwards

LIUC
Università Cattaneo

Unlike forwards, currency futures:

- trade for **standardized amounts** (depending on the currency);
- trade for a **limited number of maturity** dates (typically, March, June, September and December);
- **settle gains or losses** on a **daily** basis→ mark-to-market

Futures vs Forwards: MtM I

LIUC
Università Cattaneo

Forwards: Gains (losses) on the positions are realized (incurred) at the **maturity** of the contract.

e.g. F1$/€ = 1.27

Bgt 1y Fwd contract (1mio €)

a) S$/€ = 1.29

b) S$/€ = 1.25

Futures vs Forwards: MtM II

LIUC
Università Cattaneo

In one year's time, the buyer is to pay \$1.27 mio to purchase 1 mio € (to be received at that time)

a) After 1 year has elapsed, if the future realized spot rate ($S_{\$/€}$) is 1.29, the buyer will eventually gain \$(1.29-1.27)*1 mio = \$20,000.

b) Conversely, if $S_{\$/€}$ = 1.25, he will incur a loss equal to \$(1.25-1.27)*1 mio = -\$20,000.

Futures vs Forwards: MtM III

LIUC Università Cattaneo

Futures: CCP-based → the Clearing House requires both parties of a futures transaction to post margins in a **margin account** held at a brokerage house.

The amount of margins to be posted is typically a % of the futures' notional value. The margins' balance is "updated" **daily**, depending on the market value of the contract (computed at the daily settlement price).

Futures vs Forwards: MtM IV

LIUC
Università Cattaneo

Whenever the balance falls below a pre-specified threshold (**maintenance level**) after the daily MTM, the involved party will receive a "**margin call**" to post additional money in the margin account.

Futures vs Forwards: MtM V

e.g. 1st June 201X

Bgt GBP futures contract @ $1.55/£ to purchase £ 63,000 in three months

Initial margin = $ 6,000

Maintenance level = $ 5,000

Initial contract value = $(1.55*63,000) = $ 97,650

2nd June 201X

End of day settlement price $1.57/£

Daily gain to be credited to the margin deposit $(1.57*63,000) – 97,650 = 98,910 – 97,650 = $1,260

Futures vs Forwards: MtM VI

LIUC
Università Cattaneo

e.g. 3rd June 201X

End of day settlement price $1.53/£

Daily loss to be debited to the margin deposit $(1.53*63,000) – 98,910 = - $2,520

Margin balance = $(7,260 – 2,520) = $4,740

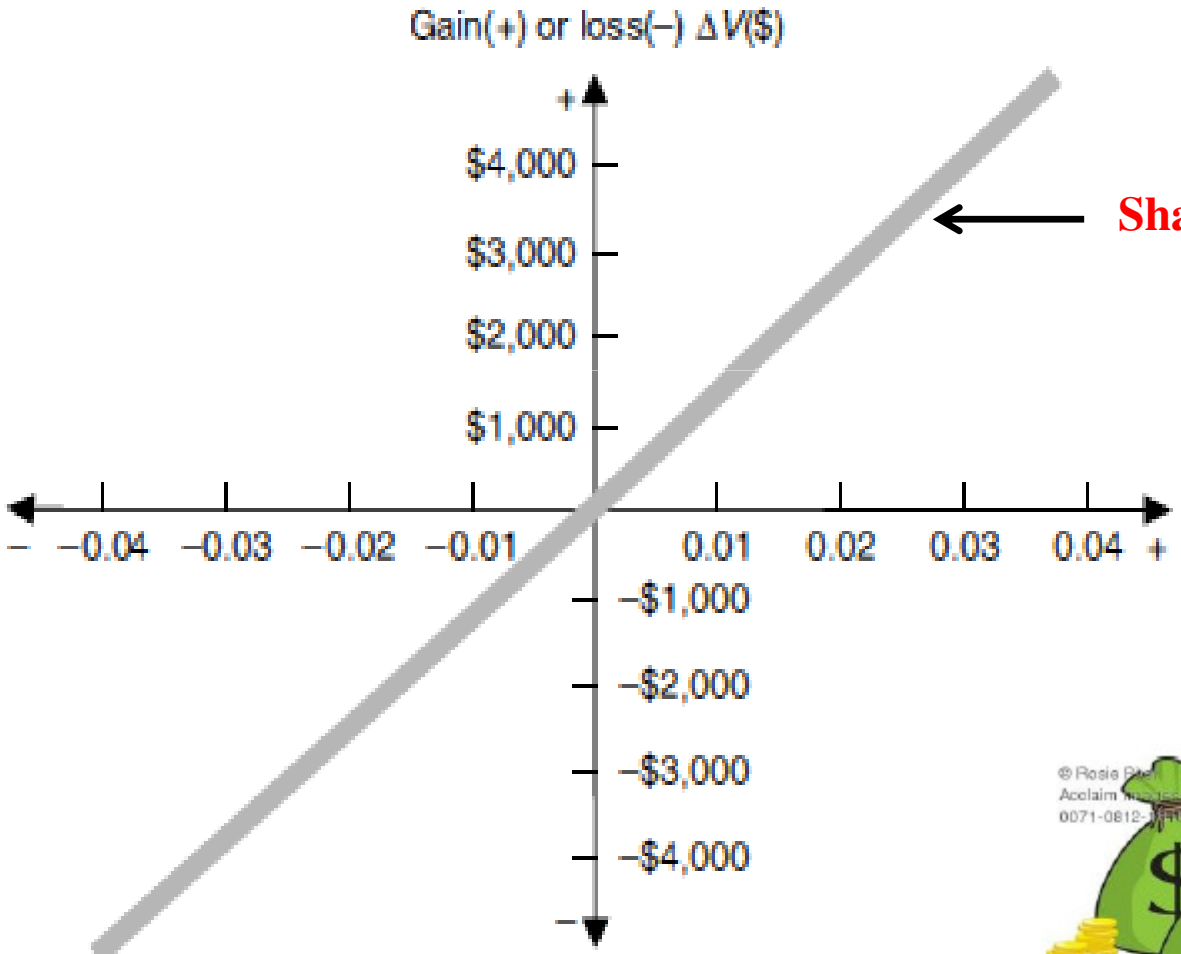
Margin call = $(5,000-4,740) = $260

A **futures** contract is **equivalent** to **entering a forward** contract **each day** and settling each forward contract before opening another one

Watch out

Futures	Forwards
Central counterparty (Clearing House) bearing the settlement risk ⇩ **Margins are required**	No Central Counterparty: the settlement risk is faced by the two parties involved ⇩ **No margins required**
Marking-to-market risk ⇩ The amount in the margin account not only depends on the entire path of the futures price from the initial purchase, but also on the interest rates earned in the account or forgone on cash contributions to the account	**No marking-to-market risk:** ⇩ Gains or losses on the forward positions will be eventually realized at the maturity of the contracts

Futures: Payoff Profile



Shaded band = MtM risk

Currency Options

Options I

LIUC
Università Cattaneo

Options are derivative contracts that give the buyer the opportunity (**not the obligation**) to buy or to sell the underlying asset at a given price sometime in the future

Options II

LIUC
Università Cattaneo

Some points to be stressed:

- Underlying: either currency futures (**futures options**) or spot currency (**spot options**);
- American (exercise up to maturity) vs European options (exercise at maturity);
- Moneyness and intrinsic value;
- Option premium: intrinsic value & time value

Futures options vs Spot options

LIUC
Università Cattaneo

Futures options: options that give the buyer the right to buy or sell currency futures contracts at the strike/exercise price

Spot options: options that give the buyer the right to buy or sell the currency itself at the strike/exercise price

Moneyness & Intrinsic Value

S= market price of the underlying,

X= strike price,

Premium= 0

	Out of the money	**At the money**	**In the money**
CALL	X > S	X = S	X < S
PUT	X < S	X = S	X > S

Intrinsic Value: extent to which an option is in the money

Option premium

The option premium consists of two parts

Intrinsic value

Time value

Before expiry, there is always some possibility that the option might end up more in the money (i.e. with a higher intrinsic value)

The mkt value of a currency option I

LIUC Università Cattaneo

Factors affecting an option' s market value:

1. **Intrinsic value**: the more the option is in the money, the higher is the option premium;
2. **Volatility of the underlying exchange rate**: the more volatile is the underlying, the greater the chance that the option will be exercised (*ceteris paribus*);
3. **American** vs **European option type**: American options are more "flexible" and consequently more valuable than European options;

The mkt value of a currency option II

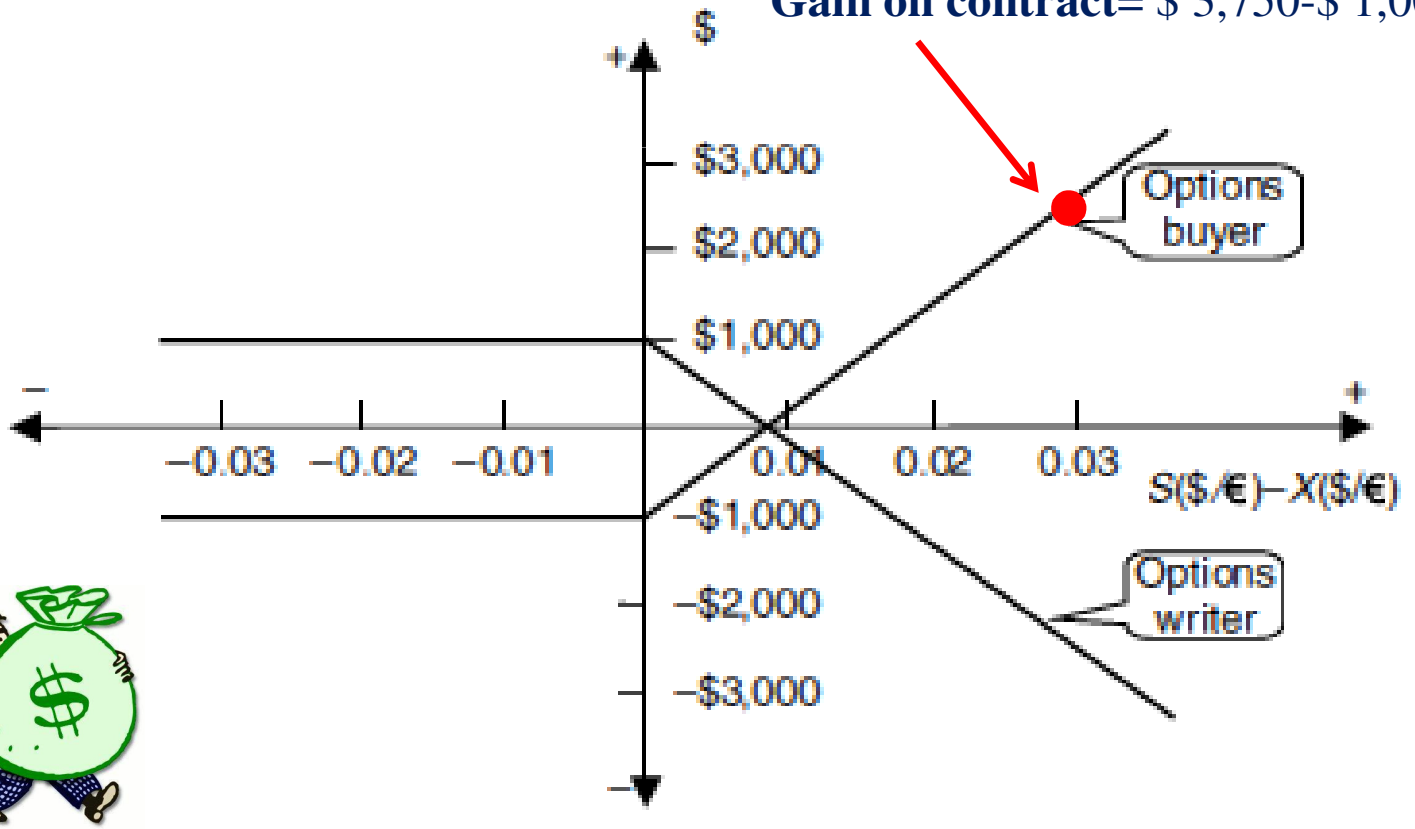
LIUC Università Cattaneo

4. **Interest rates**: the higher the interest rates, the lower the present value of the exercise price. This should increase (reduce) the mkt value of a call (put);
5. **Forward premium/ discount**: (*ceteris paribus*) the greater is the fwd discount (i.e. the expected decline in the FX value of a currency), the higher (lower) is the value of a put (call) option. The reverse holds for fwd premia;
6. **Length of the period to expiry**: (*ceteris paribus*) the longer the maturity, the greater the chance that the option will move into money

Payoff profiles

Call on 125,000 € (std amount), **X** (strike) = \$1.12, **Premium** = \$ 1,000

Realized spot rate= \$ 1.15
Intrinsic value= \$ 0.03
Gain on contract= \$ 3,750-\$ 1,000= \$2,750



How to construct synthetic forwards combining call and put options

Put-Call-Forward Parity I

Deal	Cash Flow t_0	Cash Flow t_1 $S_{\$/€}<X_{\$/€}$	Cash Flow t_1 $S_{\$/€}>X_{\$/€}$
Buy Call	-C	0	Buyer's gain $S_{\$/€} - X_{\$/€}$
Sell Put	+P	Seller's loss $S_{\$/€} - X_{\$/€}$	0
Total Payoff	**P-C**	**$S_{\$/€} - X_{\$/€}$**	**$S_{\$/€} - X_{\$/€}$**

Put-Call-Forward Parity II

LIUC Università Cattaneo

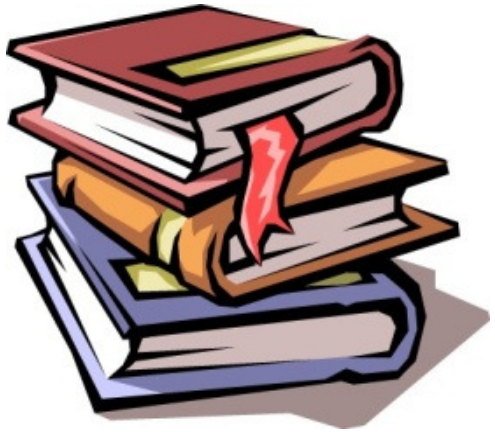
A fwd purchase of € against $ is equivalent to…

Deal	Cash Flow t_0	Cash Flow t_1 $S_{\$/€}<X_{\$/€}$	Cash Flow t_1 $S_{\$/€}>X_{\$/€}$
Borrowing $ to buy €	$ borrowed $+\frac{X_{\$/€}}{(1+r_{\$})^T}$	$ owed $-X_{\$/€}$	$ owed $-X_{\$/€}$
Investing in €	$-\frac{S_{0\$/€}}{(1+r_{€})^T}$	€ earned $S_{T\$/€}$	€ earned $S_{T\$/€}$
Total Payoff	$+\frac{X_{\$/€}}{(1+r_{\$})^T} \quad -\frac{S_{0\$/€}}{(1+r_{€})^T}$	$S_{\$/€} - X_{\$/€}$	$S_{\$/€} - X_{\$/€}$

Put-Call-Forward Parity III

$$P - C = + \frac{X_{\$/€}}{(1+r_{\$})^{T}} - \frac{S_{0\$/€}}{(1+r_{€})^{T}}$$

Option combination's **net cost**



Fwd purchase of €'s net cost

Payoff profiles

Premium = $1,000

To sum up

LIUC
Università Cattaneo

	Forwards	Futures	Options
Delivery discretion	None	None	Buyer's discretion
Maturity date	Any date	Pre-specified (depending on the Exchange)	Pre-specified (depending on the Exchange)
Contracted amount	Any amount	Pre-specified (depending on the currency and on the Exchange)	Pre-specified (depending on the currency and on the Exchange)
Margin requirements	Informal (if any)	Defined by the Clearing House	Defined by the Clearing House
Central counterparty	No	Clearing House	Clearing House
Major users	Hedgers	Speculators	Both

To put it into practice I

	Strike	Price
1 year Call $_{C1/C2}$	C_1 .63/C_2	.01 C_1
1 year Fwd$_{C1/C2}$		C_1 .624/C_2
r_{C1}		5.5%
r_{C2}		7.5%
$S_{0\ c1/c2}$		C_1 .625/C_2
1 year Put $_{C1/C2}$	C_1 .63/C_2	**?**

To put it into practice II

- A call option on Canadian dollars with a strike price of $.60 is purchased by a speculator for a premium of $.06 per unit. Assume each option calls for the delivery of 50,000 CAD.

  If the Canadian dollar's spot rate is $.65 at the time the option is exercised, what is the net profit to the speculator?

  What would the spot rate need to be at the time the option is exercised for the speculator to break even?

  What is the net profit to the seller of this option?

  Draw the buyer's and the seller's payoff charts.

To put it into practice III

- A put option on Australian dollars with a strike price of $.80 is purchased by a speculator for a premium of $.02. If the Australian dollar's spot rate is $.74 on the expiration date, should the speculator exercise the option on this date or let the option expire?

  Draw the buyer's and the seller's payoff charts.