ACI Dealing Certificate

Preparation Course

HCMC-HANOI

September - October 2011

ATF LUXEMBOURG

Doumart Consulting s.a.
Luxembourg

ACI
THE FINANCIAL MARKETS ASSOCIATION

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Presentation of the lecturer at the slide # 845

Schedule
ACI Dealing Certificates

In Ho Chi Minh City

Day 1

Global Introduction
Requirement, Target and Methodology presentation
Test on "Model Code Global Knowledge"
Market History and Context
Basic Calculations, Cash

Days 2 & 3

Cash, Papers, Repo's, Derivatives (FRA, Futures, IRS)
Theory and exercises + *daily "Model Code"*

Day 4

Morning : Examination
Afternoon : Correction and exercises
+ Individual Meeting

break (preparation second part, especially "Model Code")

Schedule
ACI Dealing Certificates

In Hanoi

Day 5

Morning : Examination “Model Code” + quick review of the 1st week

Afternoon : Spot Cross (intro)

Correction examination “Model Code”

Day 6 & 7

Spot Cross, Forwards, Swaps,

Options

Risk Management

Global Review of the materiel *(with group test)*

Day 8

Examination

Correction

Last review of the materiel

Examination Procedure

Format:

The examination consists of

- a single paper
- of 2 hours duration
- divided into the following 9 topic baskets:

Examination Procedure

9 topic baskets :

	QUESTIONS	MARKS	MIN %	MINIMUM
Basic Interest Rate Calculations	5	5	*40%*	2
Cash Money Market	5	5	*40%*	2
Cash Money Market Calculations	5	5	*40%*	2
Foreign Exchange	10	10	*40%*	4
Foreign Exchange Calculations	5	5	*40%*	2
Forward-forward, FRAs and Money Market Futures & Swaps	10	10	*40%*	4
Options	5	5	*40%*	2
Principles of Risk	5	5	*40%*	2
The Model Code	30	30	*50%*	15
Total maximum score 80 marks	**80**	**80**	***60%***	**48**

Examination Grade

The overall pass level is 60% (48 marks),

assuming that the minimum score criteria for each of the topic baskets is met.

There is a minimum score criteria of 50% for the Model Code section and 40% for each of the other topic baskets.

Grades:

Pass 60%
Merit 70-79.99%
Distinction 80% and above

Already some 19 ACI Session in …

Romania *(2006-2007-2008-2009-2010)*
Bulgaria *(2009)*
China *(2007)*
Croatia *(2008-2009)*
Macedonia *(2008)*
Luxembourg *(2008-2010-2011)*
Mongolia *(2008)*
Slovakia *(2008)*
Ukraine *(2009)*
Vietnam *(2009-2010-2011)*

ACI Dealing Certificate Preparation Course

After 4 years of our ACI DC Preparation courses, over 200 participants have succeeded at the very official ACI Dealing Certificate.

A great success rate that is largely attributed by the participants (beside their high personal motivation) to the original methodology implemented by the lecturer, the in-depth (individual and in group) explanations and the practical exercises.

Last year (2010), our second ACI DC session in Vietnam had a splendid ratio of success of **95%**

Benefits of ACI Examinations

- ACI -The Financial Markets Association is the largest international professional body for dealers and back office personnel in the wholesale financial markets. ACI's membership spans over 80 countries.
- ACI provides a suite of specialised examinations targeting Foreign Exchange and Money Markets, Derivatives, Repos, Risk Management etc for both front, middle and back-office staff. It should be noted that ACI provides an examination service and does not provide training programmes.
- The wholesale financial markets are dynamic and fast changing and these conditions demand highly qualified people with wide-ranging market skills and knowledge. ACI's education programme sets out syllabi in three subject areas that test skills, knowledge and the understanding of wholesale financial market products, the market environment and professional behaviour.
- **ACI's education programme provides a globally acknowledged, portable, professional qualification that enhances career prospects, improves job performance, and sets benchmarks within the industry.**
- ACI regularly communicates with a wide range of national Regulators on the education and training of market participants. ACI also works closely with regulatory bodies in a number of countries to ensure that market standards, ACI's examinations and regulatory requirements all find common ground.

Syllabus
ACI Dealing Certificates

0. Preamble
1. Basic Interest Rate Calculations
2. Cash Money Markets
3. Foreign Exchange
4. Forward-forwards, FRAs and Money Market Futures & Swaps
5. Options
6. Principles of Risk
7. The Model Code
8. Sundries

Preamble ACI

ACI
Association Cambistes Internationaux

- Origin
- Evolution
- Mission
- Organisation
- Model Code
  - Origin
  - History
  - Need
  - Scope/Importance

ACI
THE FINANCIAL MARKETS ASSOCIATION

ACI
Association Cambistes Internationaux

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  - Scope/Importance

ACI - The Financial Markets Association,

was founded in France in 1955 following an agreement between foreign exchange dealers in Paris and London.

In the years that followed, other national associations were formed and there are now affiliated financial markets associations in 65 countries and individual members in another 17 countries.

ACI has the largest membership of any of the international associations in the wholesale financial markets.
The Head Office is based in Paris.

Its Mission Statement is to be
- a leading global association of wholesale financial market professionals
- contributing to the market development through education,
- market practices,
- technical advice and networking events.

ACI
Association Cambistes Internationaux

Origin

Evolution

Mission

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ACI

ACI recently revised its membership criteria and removed the 'national' and 'international' categories, replacing these with a single membership category.

Once the effects of these changes have been incorporated it is expected that ACI will have over **15,000 members** in **78 countries** of which 66 will currently have affiliated national associations.

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ACI

The Association has a clear mission statement that being to be regarded within

the business community,
financial services industry
& by the authorities
& media as the leading association

representing the interests of the financial markets and to actively promote the educational and professional interests of the financial markets and industry.

ACI
Association Cambistes Internationaux

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Scope/Importance

A Council comprising the Presidents of each of the affiliated national associations governs ACI.

From this group is elected an Executive Committee comprising a

President,
Vice President,
Treasurer,
Chair of the Board of Education (BoE)
and the **Market Practices Committee** (CFP),
Chair of the Euribor ACI Committee
and Regional and Sub-Regional Executives

ACI
Association Cambistes Internationaux

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Scope/Importance

A common aim of all **codes of conduct** is to promote efficient market practices by encouraging high standards of conduct and professionalism. Yet, the largely unregulated global foreign exchange market thrived and expanded for decades in the major international centers without any written code or guidelines on market practice or conduct.

The situation lasted until the early 1970's when the “O’Brien Letter” was issued to authorised banks in London by the Bank of England. This short, but timely and useful, first circular dealt with a number of dealing issues and provided much needed clarification and recommendations on some market practices and conventions, which were expanded upon in later editions.

ACI

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Scope/Importance

The breakdown of the main fixed exchange rate structure in 1973 heralded a new era in exchange and later interest rate volatility and the repercussions thereof highlighted the need for a more formal international approach to market practice conduct and ethics.

From 1980, the emergence of new markets and instruments such as financial futures, interest rate swaps, options and other derivatives employed by treasury and capital markets dealers further underlined the urgency of the situation.

In 1975 the first ACI Code of Conduct covering foreign exchange and euro-currency dealing was published. There followed similar publications by the markets in New York (1980), London (1990), Singapore (1991) and Tokyo in 1995.

ACI

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Scope/Importance

The need for one Model Code

The Model Code has been compiled in response to an urgent international need amongst dealers and brokers operating in the OTC foreign exchange, money and derivatives markets.

The Committee for Professionalism (CFP) of ACI - The Financial Markets Association has become increasingly aware of this need through regular contact with its membership of over 24,000 dealers, brokers, middle and back office staff in over 80 countries.

Until recently, the syllabus for the Code of Conduct examination in the ACI Dealing Certificate recognised the Codes of Conduct of the four main centres: London, New York, Singapore and Tokyo in addition to the ACI's own Code.

Candidates preparing for the examination were therefore obliged to undertake a long and arduous study of the provisions of all five publications.

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ACI

The need for one Model Code

Following a comprehensive review of the situation, the CFP concluded that, despite the existence of some difficult issues and of differences in structure, there was an urgent need for one international or global code that could cover the essential provisions of all five recognised publications.

The conduct and best practice recommended in the five codes is in general conformity and, with a few notable exceptions, the differences that do exist are mostly those of emphasis and scope. It was therefore felt that a Model Code embracing the main provisions of the recognised codes could serve as a valuable guide for the international dealing membership.

It would also serve as practical study material for junior dealers and, with an amended syllabus recognising the new structure, for examination candidates.

The need for a Model Code is more pronounced in many of the emerging markets where a professional code is lacking.

ACI
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- Origin
- History
- Need
- Scope/Importance

ACI

Scope and importance

The scope of The Model Code is wide ranging, encompassing the over-the-counter markets and instruments traded by international bank treasury departments as listed in Appendix 2.

The diversity of markets and products now traded and arbitraged by bank dealers dictates that there will inevitably be some areas of overlap where separate individual or local market codes already exist.

Mindful of this, great care has been exercised in the drafting of the text, in order to ensure that the provisions and market practice recommended herein are not substantially at variance with recognised codes already in place.

At the same time, The Model Code remains consistent with the high standards of integrity and professionalism that have existed in our core markets, since the first ACI Code of Conduct was published in 1975

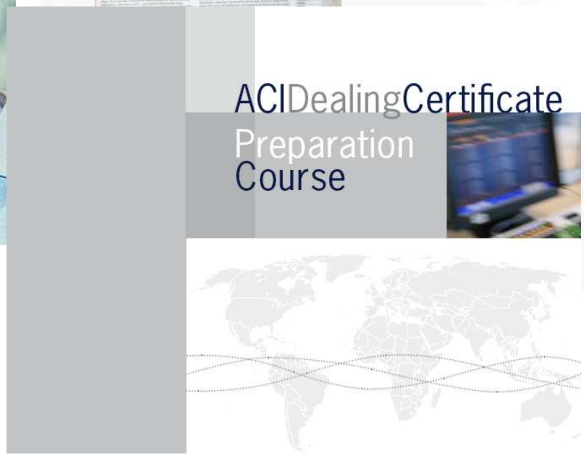
How is it still possible ?

Libération

L'homme qui a fait sauter sa banque

Leeson ...

Kerviel



Syllabus
ACI Dealing Certificates

Chap. 1

1. Basic Interest Rate Calculations
2. Cash Money Markets
3. Foreign Exchange
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CHAP 1
Interest Rate Calculation

Straight definition
Rates and periodicities
Swift Currency Codes
Dates, maturities
Quotation Methods
Basis
Formula and freq of int payment
Fixing
Roll Over
Curve notions
Zero Coupon and interest Rates
Interpolation (linear and curvilinear)
Position

Aim:

To understand the principles of the time value of money. To be able to calculate short-term interest rates and yields, including forward-forward rates, and to use these interest rates and yields to calculate payments and evaluate alternative short-term funding and investment opportunities.

Candidates should know what information is plotted in a yield curve, the terminology describing the overall shape of and basic movements in a curve, and the classic theories which seek to explain changes in the shape of a curve. They should also know how to plot a forward curve and understand the relationship between a yield curve and forward curves.

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Candidates should be able to:

- calculate present value and future value using the arithmetic techniques of discounting and compounding for both a money market instrument terminated at maturity and one that is rolled over at maturity
- calculate simple interest rates using different day count and annual basis conventions
- identify the day count and annual basis conventions for the euro, sterling, Swiss franc, US dollar and Japanese yen
- fix same-day, next-day, spot and forward value dates, and maturities under the modified following business day convention and end/end rule
- fix the conventional frequency and timing of payments by cash money market instruments, including those with an original term to maturity of more than one year
- calculate broken dates and rates through linear (straight line) interpolation
- define EURIBOR, LIBOR and EONIA
- convert interest rates and yields between the money market basis and bond basis in currencies for which there is a difference
- convert interest rates and yields between annual and semi-annual compounding frequencies
- calculate a forward-forward rate from two mismatched cash rates
- calculate a cash rate from a series of forward-forward rates for consecutive periods
- calculate the value of a discount-paying money market instrument from its discount rate (straight discount) and convert a discount rate directly into a true yield
- plot a yield curve, describe its shape and the basic changes in its shape using market terminology, and outline how the Pure Expectations Theory, Liquidity Preference Theory and Market Segmentation Hypothesis explain the shape of the curve

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Position

Straight Definition

A Classic Deposit Interest Rate Operation :

consists in a transaction (retail and wholesale) between a borrower and a lender of a principal amount plus a fixed pre-agreed percentage paid at a fixed maturity.

A fixed deposit is not renegotiable except if both parties agree on a penalty.

$$\text{INTEREST} = \text{Nominal} * \frac{\text{Days}}{\text{Basis}} * \frac{\text{Rate}}{100}$$

%Period %Nominal

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Position

Straight Definition

Now $L \xrightarrow{K} B$

Later $L \xleftarrow{K \;+\; \%} B$

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Rates and periodicities

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Interest Rate Calculation

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Position

For deposits up to 1 year

The repayment of interest is done at the maturity

$$\textbf{Nominal} * \left\{ 1 + \frac{\text{Rate}}{100} * \frac{\text{Full Days}}{\text{Basis}} \right\}$$

For deposits over the year

The payment of interest is done annually at the anniversary of the first transfer

$$\textbf{Nominal} * \frac{\text{Rate}}{100} * \frac{\text{1 Year Days}}{\text{Basis}}$$

and at the maturity

$$\textbf{Nominal} * \left\{ 1 + \frac{\text{Rate}}{100} * \frac{\text{Residual Days}}{\text{Basis}} \right\}$$

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Rates and periodicities

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Position

For deposits up to 1 year

The repayment of interest is done after 9 months

$$\textbf{100.000.000} * \left\{ 1 + \frac{3.25}{100} * \frac{273}{360} \right\}$$

= EUR 102.464.583,33

For deposits over the year

The payment of interest is done after 1 year

$$\textbf{100.000.000} * \frac{3,50}{100} * \frac{365}{360}$$

= EUR 3.548.611,11

and after 14 months

$$\textbf{100.000.000} * \left\{ 1 + \frac{3,50}{100} * \frac{62}{360} \right\}$$

= EUR 100.602.777,78

Rates and periodicities

For deposits up to 1 year

EX 100 MIO 9 M EUR at 3.25

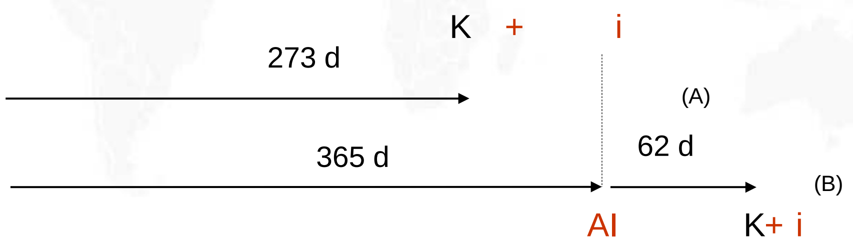
- ▶ 1 sole payment after 9 Mths (273) of 102.464.583,33 (A)

For deposits over the year

EX 100 MIO 14 M EUR at 3.50

- ▶ 1 payment after 1 year (365) of 3.548.611,11
- ▶ 1 payment after 14 months of 100.602.777,78 (B)

KNOWING THAT 62 DAYS LEFT



Swift Currency Codes

Foreign currency symbols can be confusing, especially when various countries use different symbols for the same currencies.

Foreign currencies are recognized by a three letter code. The first two letters represent the country in question and the third letter for the currency used. The code for the dollar, for example, is

USD (**U** nited **S** tates **D** ollar),

for the Euro we use EUR (**EUR**o)

and

for the Japanese Yen JPY (**J**a**P**an **Y**en).

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Position

Swift Currency Codes

Appendix 6 SWIFT Curreny Codes

Recognised Swift Currency Codes for the currencies of the 67 Affiliated Members of ACI - The Financial Markets Association

Americas
Argentina ARS
Bahamas BSD
Canada CAD
Mexico MXN
USA USD
Asia Pacific
Australia AUD
Hong Kong HKD
India INR
Indonesia IDR
Japan JPY
Korea (Republic of) KRW
Macau MOP
Malaysia MYR
New Zealand NZD
Pakistan PKR
Philippines PHP
Singapore SGD
Sri Lanka LKR
Thailand THB
Europe
Austria EUR
Belgium EUR
Channel Islands GBP
Croatia HRK
Cyprus CYP
Czech Republic CZK
Denmark DKK
Finland EUR
France EUR
Georgia GEL
Germany EUR
Greece EUR
Europe
Hungary HUF
Iceland ISK
Ireland EUR
Israel ILS
Italy EUR
Luxembourg EUR
Macedonia MKD
Malta MTL
Monaco EUR
Netherlands EUR
Norway NOK
Poland PLN
Portugal EUR
Romania RON
Russia RUB
Serbia & Montenegro CSD
Slovakia EUR
Slovenia SIT
Spain EUR
Sweden SEK
Switzerland CHF
United Kingdom GBP
Middle East and Africa
Bahrain BHD
Egypt EGP
Jordan JOD
Kenya KES
Kuwait KWD
Lebanon LBP
Mauritius MUR
South Africa ZAR
Tanzania TZS
Tunisia TND
United Arab Emirates AED

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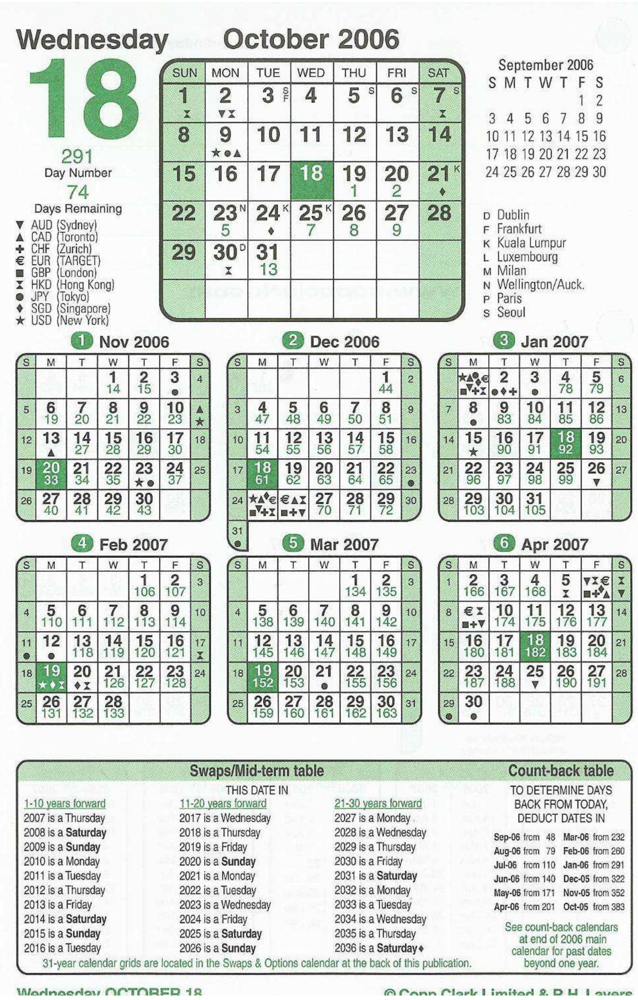
Position

Dates, maturities

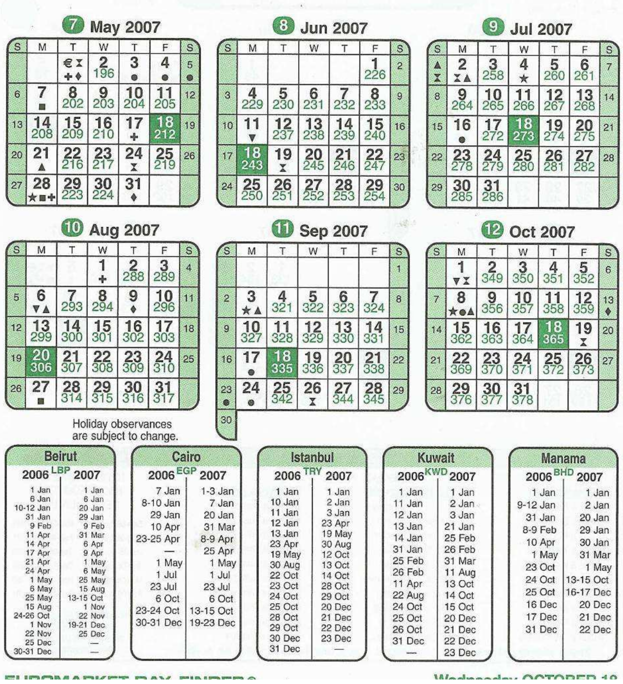
- Short and Fixed Dates
- Calendar Months
- End/End (Ultimo)
- Broken dates

Business dates



Here we are the 16th, dealing value date the 18th

www.goodbusinessday.com



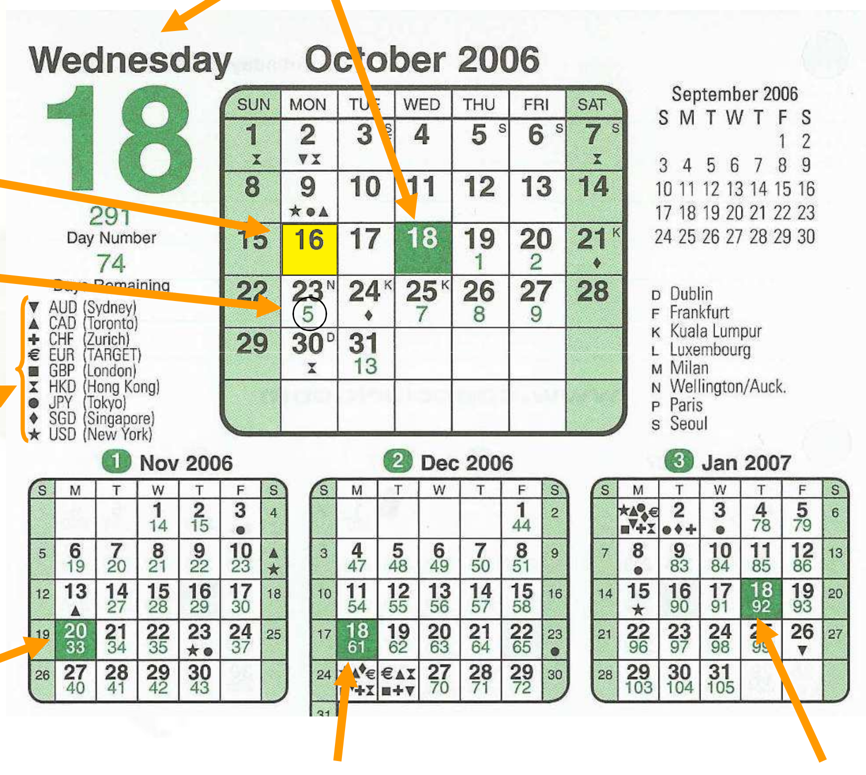
Dates, maturities

Trading Date

Number of days since value date

Symbol for country closed

1 Mth fixed date maturity



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Short Dates

CHAP 1
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Position

TODAY	2/10/2006	
O/N	2/10/2006	3/10/2006
T/N	3/10/2006	4/10/2006
S/N	4/10/2006	5/10/2006
1W	4/10/2006	11/10/2006
2W	4/10/2006	18/10/2006
3W	4/10/2006	25/10/2006

Loan from today to tomorrow	Over Night
Loan from tomorrow to the next day	Tom Next
Loan from spot to the day after	Spot Next
Loan from spot for a week	Spot a week
Loan from spot for 2 weeks	2 weeks
Loan from spot for 3 weeks	3 weeks

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Fixed (Euro)Dates and Calendar Months

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Position

TODAY	2/10/2006		
SPOT DATE	**4/10/2006**	**SO VALUE THE 4TH**	
1 MONTH	~~4/11/2006~~	SAT	**6/11/2006**
2 MONTHS	**4/12/2006**	MON	
3 MONTHS	**4/01/2007**	TUE	
6 MONTHS	**4/04/2007**	WED	
9 MONTHS	~~4/07/2007~~	WED	**5/07/2007**
1 YEAR	**4/10/2007**	TUE	

To create the fixed dates, we keep the same day for the next months except if that date falls on the WE or on an official holiday in the country of the currency (here USA for USD)

Fixed (Euro)Dates and Calendar Months

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The GBP is traded today's Value !!!

End/End (Ultimo)

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Position

TODAY	27/10/2006
SPOT DATE	31/10/2006 SO VALUE END END
1 MONTH	30/11/2006 THU
2 MONTHS	29/12/2006 FRI
3 MONTHS	31/01/2007 WED
6 MONTHS	30/04/2007 MON
9 MONTHS	31/07/2007 TUE
1 YEAR	31/10/2007 WED

If the value date is the last open day of the month, we trade "end end" maturities for the fixed eurodates. It means that the next maturities will be the last open day of the next months

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Position

Broken dates

When the maturity of the trade is not a short or a classical fixed date,

we talk about broken dates maturities.

We 'll see forward the way we can evaluate the broken date rate

IMM Dates

Turn of the Year

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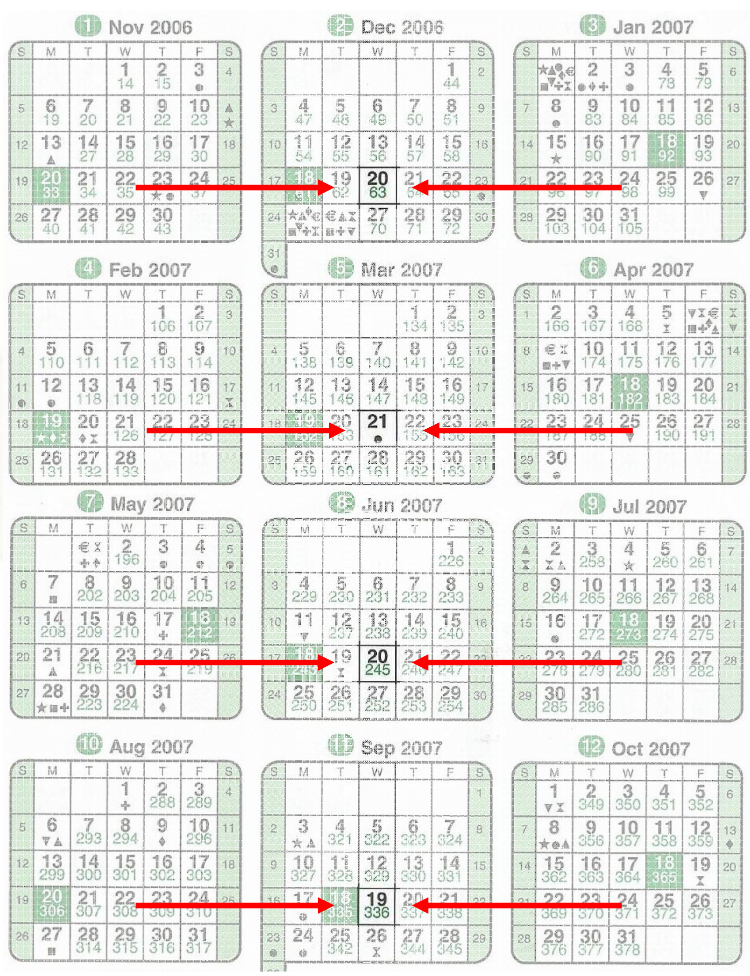
Position

3Mths IMM



- Season Month
- Wednesday
- 3rd Wed

20-12-06

21-03-07

20-06-07

19-09-07

Straight definition
Rates and periodicities
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Quotation methods

- Worldwide Method
- London Method
- Fractions and spreads
- Decimals

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Worldwide Method

A quotation is the price proposed to buy and to sell a specific product at a specific maturity.
The first (left) price is the price the “quoter” is decided to pay,
the second (right) price is the “quoter” is decided to sell.

Ex. : 3 MTHS USD 2.80 – 2.85

The “quoter” will pay 2.80 % if he borrows the capital and will receive 2.85 % if he lends the capital

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London Method

Exactly the opposite way

Ex. : 3 MTHS USD 2.85 – 2.80

The “quoter” will pay 2.80 % if he borrows the capital and will receive 2.85 % if he lends the capital

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Fractions and spreads

0					
0,03125	1/32				
0,0625		1/16			
0,09375	3/32				
0,125			1/8		
0,15625	5/32				
0,1875		3/16			
0,21875	7/32				
0,25				1/4	
0,28125	9/32				
0,3125		5/16			
0,34375	11/32				
0,375			3/8		
0,40625	13/32				
0,4375		7/16			
0,46875	15/32				
0,5					1/2
0,53125	17/32				
0,5625		9/16			
0,59375	19/32				
0,625			5/8		
0,65625	21/32				
0,6875		11/16			
0,71875	23/32				
0,75				3/4	
0,78125	25/32				
0,8125		13/16			
0,84375	27/32				
0,875			7/8		
0,90625	29/32				
0,9375		15/16			
0,96875	31/32				
1					

Fractions and spreads

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example

1M	6 1/8
2M	6 3/16
3M	6 5/16
6M	6 3/8
9M	6 1/2
12M	6 11/16

To standardize the quotations, initially the quotations were always made in fractions and a spread (depending on the liquidity of the product) was applied.

The Higher the liquidity of the product, the smaller the spread between bid and ask prices

Decimals

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The quotation, especially in highly liquid products, is proposed in decimals or even smaller units.

Ex O/N EUR is 2,74**50** - 2,75**00**

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Basis

- For Money Market Operation :
  Actual/360 (*)
- For some Govies :
  Actual/Actual
- For International Eurobond :
  30/360
  also named the Bond Basis

(*) 365 for U.K. and several commonwealth countries

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Position

Actual/360 Euro Basis

The proportion of the period is the exact number of days between the 2 dates (calendar dates) divided by

- **360** (calculated days for 1 year) for the majority of currencies **(including AUD or NZD)**
- **365** (calculated days for 1 year) for some specific currencies like **GBP, HKD, SGD, etc… (U.K. and some commonwealth countries)**

Ex. : From the 4/10/06 to 4/01/07 **92 DAYS**

So 92/360 or 92/365

Actual/Actual

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The proportion of the period is the exact number of days between the 2 dates divided by

the **EXACT NUMBER** of days in the 1 Year

Ex. : From the 4/10/06 to 4/01/07 **92 DAYS**

So 92/365 or 92/366 if leap year

Actual/Actual

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What is a leap year?

A leap year is a year with one extra day inserted into February, the leap year is 366 days with 29 days in February as opposed to the normal 28 days. (There are a few past exceptions to this)

Which years are leap years?

In the Gregorian calendar, which is the calendar used by most modern countries, the following rules decides which years are leap years:

Every year divisible by 4 is a leap year.

- But every year divisible by 100 is NOT a leap year
- Unless the year is also divisible by 400, then it is still a leap year.
- This means that year 1800, 1900, 2100, 2200, 2300 and 2500 are NOT leap years, while year 2000 and 2400 are leap years.

On excel :

```
=IF(MOD(C11;4)=0;IF(MOD(C11;100)=0;IF(MOD(C11;400)=0;"OK";"NO");"OK");"NO")
```

30/360 Bond Basis

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Position

The year is perfectly divided in 12.
One straight month has always 30 days

Ex1. : From the 4/10/06 to 4/01/07 **90 DAYS**
So 90/360

When, from the 4/10/06 to 5/01/07 **91 DAYS**
So 91/360

Ex2. : From the 30/01/07 to 30/03/07 **60 DAYS**
So 60/360

When, from the 30/01/07 to 29/03/07 **59 DAYS**
So 59/360

30 and 30^E /360 Bond Basis

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Position

ISDA Formula for 30 &30^E method :

BD = 360*(Ym-Ys)+30*(Mm-Ms)+(Dm-Ds)

Where :

BD = Number of Bond Days
Ym = Year at maturity   Ys = Year at start
Mm = Month at maturity   Ms = Month at start
Dm = Day at maturity   Ds = Day at start

with :

If D = 31 always use 30

except for
Dm on **30Method** use 30 **just in case of Ds = 30 or 31**

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30 and 30^E /360 Bond Basis

ISDA Formula for 30 &30^E method : Example

START	MATURITY	EURO	30	30E
31/01/2007	20/02/2007	20	20	20
30/01/2007	20/02/2007	21	20	20
29/01/2007	20/02/2007	22	21	21
31/01/2007	31/03/2007	59	60	60
30/01/2007	31/03/2007	60	60	60
29/01/2007	31/03/2007	61	62	$\boxed{61}$
31/07/2007	31/08/2007	31	30	30
30/07/2007	31/08/2007	32	30	30
29/07/2007	31/08/2007	33	32	$\boxed{31}$
1/08/2007	31/08/2007	30	30	$\boxed{29}$

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Formula and frequency of interest payment

$$\text{INTEREST} = \frac{\text{PRINCIPAL} * \text{RATE} * \text{DAYS}}{\text{BASIS} \quad * \quad 100}$$

BASIS:

- 360 NORMALLY
- 365 (GBP,SGD,HKD,…)

U.K. and several commonwealth countries

Formula and frequency of interest payment

$$\text{INTEREST} = \frac{1.000.000 \text{ EUR} * 4\ 5/8 * 92}{\mathbf{360} \quad * \quad 100}$$

$$= 11.819{,}4444 \text{ EUR}$$

Formula and frequency of interest payment

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Position

$$\text{SEMI ANN} = \left(\sqrt{(1 + \text{ANN RATE})} - 1\right) * 2$$

$$\text{SEMI ANN} = \left(\sqrt{(1 + 0.046875)} - 1\right) * 2$$

$$= 0{,}04634 = \frac{4{,}634}{100}$$

Formula and frequency of interest payment

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Position

$$\text{QUATERLY} = \left(\sqrt[4]{(1 + 0.046875)} - 1\right) * 4$$

$$= 0{,}04607 = \frac{4{,}607}{100}$$

Formula and frequency of interest payment

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Position

$$\text{DAILY} = \left(\sqrt[365]{(1 + 0.046875)} - 1\right) * 365$$

$$= 0{,}04581 = \frac{4{,}581}{100}$$

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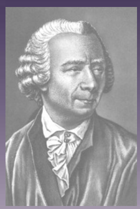
Leonhard Euler

Formula and frequency of interest payment

$$\text{FK Continuous Rate} = \lim_{X \to \infty} \left(1 + \frac{i}{X}\right)^{X}$$

$$\text{FK Continuous Rate} = \lim_{X/i \to \infty} \left\{ \left(1 + \frac{1}{X/i}\right)^{X/i} \right\}^{i}$$

$$\text{FK Continuous Rate} = e^{i}$$

I = 100*LN((1+(AR/100)))

WHERE i = I/100

JUST FOR INFO

2,71828182845904523536028747135266249775724709369995957496696762772407

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Formula and frequency of interest payment

CONVERTION BETWEEN BASIS

$$\text{Interest (MM Calc)} = K * \frac{MMR}{100} * \frac{MMD}{MMBasis}$$

$$\text{Interest (Bd Calc)} = K * \frac{BdR}{100} * \frac{BdD}{360}$$

$$\boxed{\frac{MMR}{100} = \frac{BdR}{100} * \frac{BdD}{360} * \frac{MMBasis}{MMD}}$$

Formula and frequency of interest payment

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Position

EX. 1 YEAR CHF

Rate BB — Rate MM

$$\frac{4{,}625}{100} * \frac{360}{360} * \frac{360}{365} = \frac{4{,}56164}{100}$$

Formula and frequency of interest payment

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Position

EX. For a 6 months EUR period

Rate BB — Rate MM

$$\frac{4{,}625}{100} * \frac{180}{360} * \frac{360}{183} = \frac{4{,}5492}{100}$$

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Formula and frequency of interest payment

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Position

EX. For a 3 months GBP period

Rate BB ... Rate MM

$$\frac{4,5}{100} * \frac{90}{360} * \frac{365}{91} = \frac{4,5151}{100}$$

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Formula and frequency of interest payment

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ANNUAL PERCENTAGE RATE (APR)

CLASSICAL APPROACH

$$FK = IK * \left(1 + \frac{IR * days}{100 * 360}\right)$$

ANNUAL PERCENTAGE RATE

$$\frac{days}{1\ Y\ days}$$

$$FK = IK * \left(1 + \frac{APR}{100}\right)$$

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ANNUAL PERCENTAGE RATE (APR)

$$FK = IK * \left(1 + \frac{IR * days}{100 * 360}\right)$$

CLASSICAL APPROCACH

= =

$$FK = IK * \left(1 + \frac{APR}{100}\right)^{\frac{days}{1\ Y\ days}}$$

ANNUAL PERCENTAGE RATE

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Formula and frequency of interest payment

$$\left(1 + \frac{IR * days}{100 * 360}\right) = \left(1 + \frac{APR}{100}\right)^{\frac{days}{1\ Y\ days}}$$

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Formula and frequency of interest payment

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$$\mathbf{APR} = \left\{ \left(1 + \frac{\mathbf{IR} * \text{days}}{100 * 360} \right)^{\frac{1\text{ Y days}}{\text{days}}} - 1 \right\} \times 100$$

The APR (annual percentage rate) is the rate used for the Zero Coupon Rate and consequently the Actualisation factors

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Formula and frequency of interest payment

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I 3

Comparison board

	Value	9/11/2007		CLASSIC	FIN AMT	APR
1	Monday	11/12/2006	32	4,0000	1,0036	4,1314
2	Tuesday	9/01/2007	61	4,1250	1,0070	4,2558
3	Friday	9/02/2007	92	4,2500	1,0109	4,3790
4	Friday	9/03/2007	120	4,3750	1,0146	4,5021
5	Monday	9/04/2007	151	4,5000	1,0189	4,6237
6	Wednesday	9/05/2007	181	4,6250	1,0233	4,7447
7	Monday	11/06/2007	214	4,7500	1,0282	4,8638
8	Monday	9/07/2007	242	4,8750	1,0328	4,9837
9	Thursday	9/08/2007	273	5,0000	1,0379	5,1016
10	Monday	10/09/2007	305	5,1250	1,0434	5,2181
11	Tuesday	9/10/2007	334	5,2500	1,0487	5,3348
12	Friday	9/11/2007	365	5,3750	1,0545	5,4497

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Fixing

BBA LIBOR

LONDON INTERBANK OFFERED RATE

The British Bankers Association (BBA) fixes a daily benchmark rate by reference to a panel of a dozen of Major banks.

ATF LUXEMBOURG

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Fixing

EURIBOR

EUROPEAN INTERBANK OFFERED RATE

The European Banking Association (EBA) fixes a daily benchmark rate by reference to a panel of more than 50 banks.

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Libor : BBA LIBOR PANEL

Fixed on spot basis on each London business day except for GBP (same day value)

EUR fixed on each TARGET business day (even if London is closed)

BBA LIBOR : the top **25 %** and bottom **25%** prices of the panel are discarded and the **50%** remaining is averaged

Publication by Reuters : 11 o clock London time
(= 12 o clock western continental time)

Fixing

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Fixing example for LIBOR on one month Canadian dollar (12 banks)

BANK	LIBOR FOR THE BANK
A	3,87025
B	3,87020
C	3,87012
D	3,87010
E	3,87000
F	3,86995
G	3,86992
H	3,86990
I	3,86910
J	3,86900
K	3,86850
L	3,86830

FIXING

3,86983

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Fixing

Euribor :

More contributors : More than 50 banks in Europe Europe.

FBE LIBOR : the top **15 %** and bottom **15%** prices of the panel are discarded and the **70%** remaining is averaged

So : number of banks + calculation method = Larger ratio of smaller to larger banks than in the BBA system

Publication by Reuters : 11 o clock western continental time

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Fixing

Comparison Euribor/Libor

for EUR on some dates :

	03/04/2006		
	EURIBOR	LIBOR	DELTA
1 MTH	2,64700	2,64650	0,00050
2 MTH	2,74200	2,74588	-0,00388
3 MTH	2,81800	2,81788	0,00012
6 MTH	2,99200	2,99375	-0,00175
9 MTH	3,13500	3,13938	-0,00438
12 MTH	3,25400	3,25300	0,00100
	18/04/2006		
	EURIBOR	LIBOR	DELTA
1 MTH	2,64000	2,64088	-0,00088
2 MTH	2,67400	2,67513	-0,00113
3 MTH	2,76500	2,76800	-0,00300
6 MTH	2,91600	2,91725	-0,00125
9 MTH	3,06900	3,07663	-0,00763
12 MTH	3,18500	3,19363	-0,00863
	02/05/2006		
	EURIBOR	LIBOR	DELTA
1 MTH	2,66600	2,66763	-0,00163
2 MTH	2,76300	2,76413	-0,00113
3 MTH	2,85200	2,85150	0,00050
6 MTH	3,03200	3,03588	-0,00388
9 MTH	3,19800	3,20313	-0,00513
12 MTH	3,31800	3,32063	-0,00263

We can see that EURIBOR is not always above Libor :

this is a common thinking due to the fact that smaller banks participates in the EURIBOR

Roll Over

To avoid a long term interest rate exposure,

both parties can agree on a LT loan but with a payment of interest every short periods

-K Libor6 Libor6 Libor6 Libor6 Libor6 Libor6 + K

Spot 6mths 1Year 18mths 2Years 30mths 3Years

Position

The position will determinate at which key rate the bank have or need a precise amount for a specific period.

Ex. Bank A

have lent EUR 15 million for 9 months at 5.125 % and

borrowed back 10 million at 5 % in the same period otherwise we would have a **MISMATCH.**

Obviously the bank remains short of 5 million EUR in the 9 months at …. ?

Position

Solution :

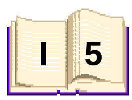
- 15.000.000 * 5.125 = - 76.875.000
+ 10.000.000 * 5 = 50.000.000

- 5.000.000 for - 26.875.000

So **short** of EUR 5.000.000 at a break even rate of

$$\frac{26.875.000}{5.000.000} = \mathbf{5.375}$$

Position



Short : Over loaned Position,
negative gap
ex: short 6 months and long 3 months

Long : Over borrowed Position,
positive gap
ex: long 6 months and short 3 months

Squared : No exposure, no gap

ISDA RECOMMENDED MARKET CONVENTIONS FOR EURO

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ISDA International Swaps and Derivatives Association, Inc.

Exhibit 1

RECOMMENDED MARKET CONVENTIONS FOR THE EURO

Euro money markets

- Day count basis: actual/360
- Settlement basis: spot (two day) standard
- Business days: TARGET operating days should form the basis for euro business days

Euro Swap Markets

- Floating day count basis: actual/360
- Fixed rate day count basis: 30/360
- Business days: TARGET operating days should form the basis for euro business days
- Fixing period: two day rate fixing convention
- Coupon frequency: annual

Euro Bond markets

- Day count basis: actual/actual
- Quotation basis: decimals rather than fractions
- Business days: TARGET operating days should form the basis for euro business days
- Coupon frequency: annual
- Settlement dates: the standard for internationally traded cross-border transactions for the euro should remain on a T+3 business day cycle

Euro foreign exchange markets

- Settlement timing: spot convention, with interest accrual beginning on the second day after the deal has been struck
- Quotation: 'certain for uncertain' (i.e. 1 euro = x foreign currency units)
- Reference rate: the ECB (or NCBs) should be responsible for the publication of daily closing reference rates

BS:9951.1

Curve notions

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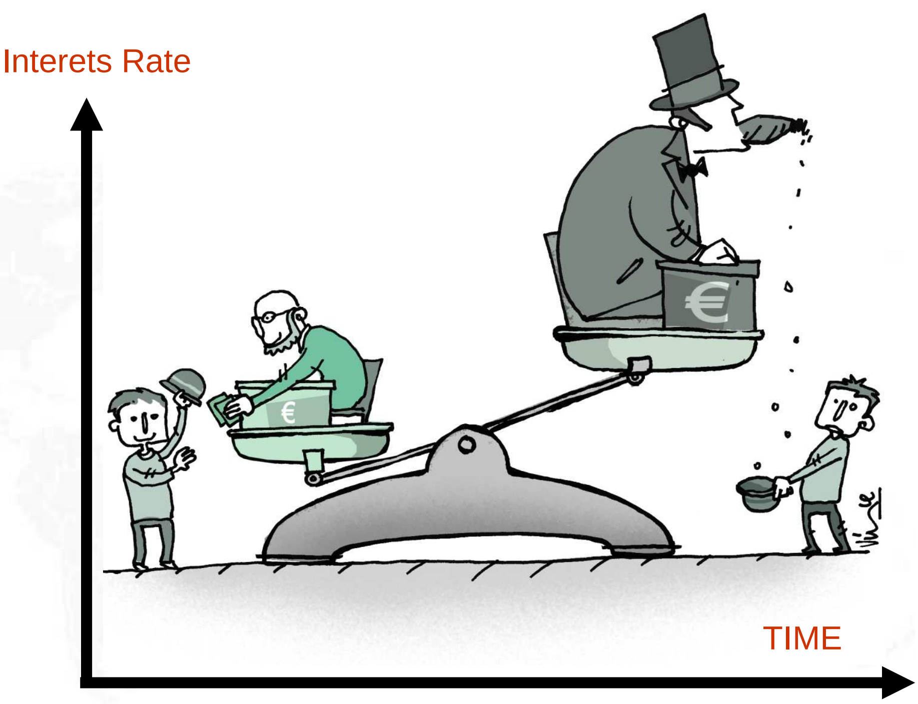

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Curve notions

Interets Rate

Y = fct (t)

In finance, the yield curve is the relation between

- the interest rate *(or cost of borrowing)* and
- the time to maturity of the debt for a given borrower in a given currency.

TIME

CHAP 1
Interest Rate Calculation

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Position

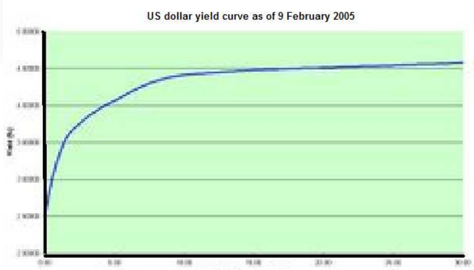
Curve notions

The curve is generally **upward sloping**

with the rates of 1 year bonds a few percentage points below the rates of 30 year bonds *in times of economic growth*.

The upward slope reflects the **added risk of keeping a bond for a longer period of time.**

The longer a bond's term, the greater the chance that its payments could decrease due to **economic risks**.



The US dollar yield curve as of 9 February 2005.

The curve has a typical **upward sloping shape**.

Curve notions

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Y is often, **but not always**, **an positive** function of t.

Yield curves are used by <u>fixed income analysts</u>, who analyze bonds and related securities, to understand conditions in financial markets and to seek trading opportunities.

<u>Economists</u> use the curves to understand economic conditions.

The yield curve function Y is actually only known with **certainty for a few specific** maturity dates, the other maturities are calculated by **interpolation**

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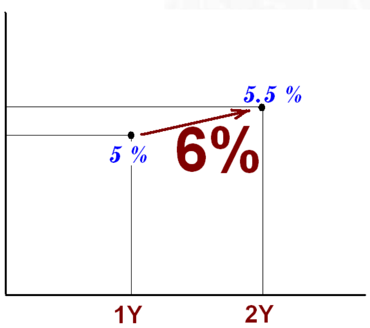
Yield curves carry an **implicit** forecast of future short-term interest rates:

For example if the <u>**zc**</u> annual yield

on a 1 year bond is 5 %, and
on a 2 year bond is 5.5%,

then the **implicit 1 Y yield** (forward rate) 1 year later is



$$\frac{1.055^2}{1.05^1} - 1 = 6.00\%$$

Curve notions

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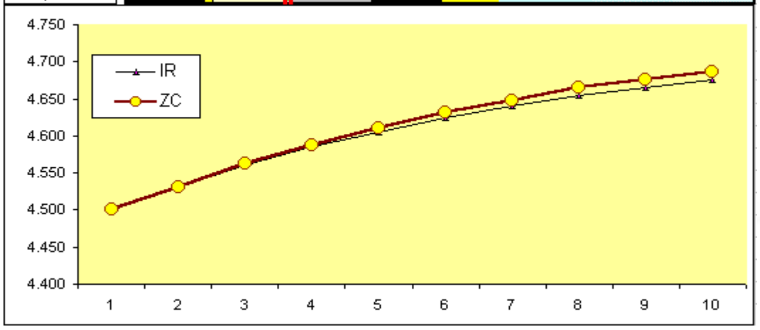
A-BOND-360 Date 03/07/03 Value 07/07/03

POSITIVE YIELD CURVE Doumart Software S.A. Luxembourg

	PER	IR	ZCR	FWD-FWD		IRS semi	IRS quart	RS An Euro
Wed, 07/07/04	1	4.500	4.500	0 / 1	4.50	4.450	4.426	4.44
Thu, 07/07/05	2	4.530	4.531	1 / 2	4.56	4.480	4.455	4.47
Fri, 07/07/06	3	4.560	4.562	2 / 3	4.62	4.509	4.484	4.50
Mon, 09/07/07	4	4.585	4.588	3 / 4	4.67	4.534	4.508	4.52
Mon, 07/07/08	5	4.605	4.609	4 / 5	4.69	4.553	4.528	4.54
Tue, 07/07/09	6	4.625	4.631	5 / 6	4.74	4.573	4.547	4.56
Wed, 07/07/10	7	4.640	4.648	6 / 7	4.75	4.587	4.561	4.58
Thu, 07/07/11	8	4.655	4.664	7 / 8	4.78	4.602	4.576	4.59
Mon, 09/07/12	9	4.665	4.675	8 / 9	4.76	4.612	4.586	4.60
Mon, 08/07/13	10	4.675	4.687	9 / 10	4.79	4.622	4.595	4.61



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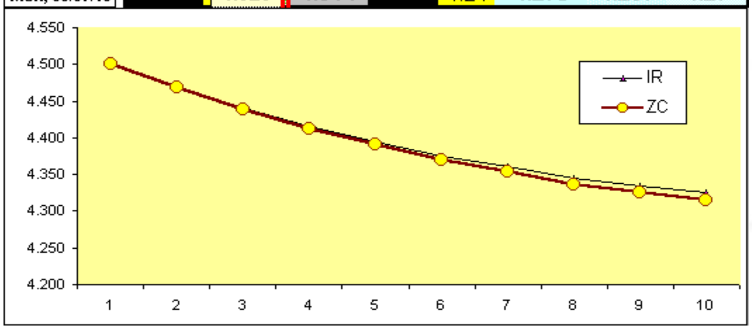
Thu, 07/07/05	2	4.470	4.469	1 / 2	4.44	4.421	4.397	4.41
Fri, 07/07/06	3	4.440	4.438	2 / 3	4.38	4.392	4.368	4.38
Mon, 09/07/07	4	4.415	4.412	3 / 4	4.33	4.367	4.344	4.35
Mon, 07/07/08	5	4.395	4.391	4 / 5	4.31	4.348	4.324	4.33
Tue, 07/07/09	6	4.375	4.369	5 / 6	4.26	4.328	4.305	4.32
Wed, 07/07/10	7	4.360	4.353	6 / 7	4.26	4.313	4.290	4.30
Thu, 07/07/11	8	4.345	4.336	7 / 8	4.22	4.299	4.276	4.29
Mon, 09/07/12	9	4.335	4.325	8 / 9	4.24	4.289	4.266	4.28
Mon, 08/07/13	10	4.325	4.314	9 / 10	4.21	4.279	4.257	4.27



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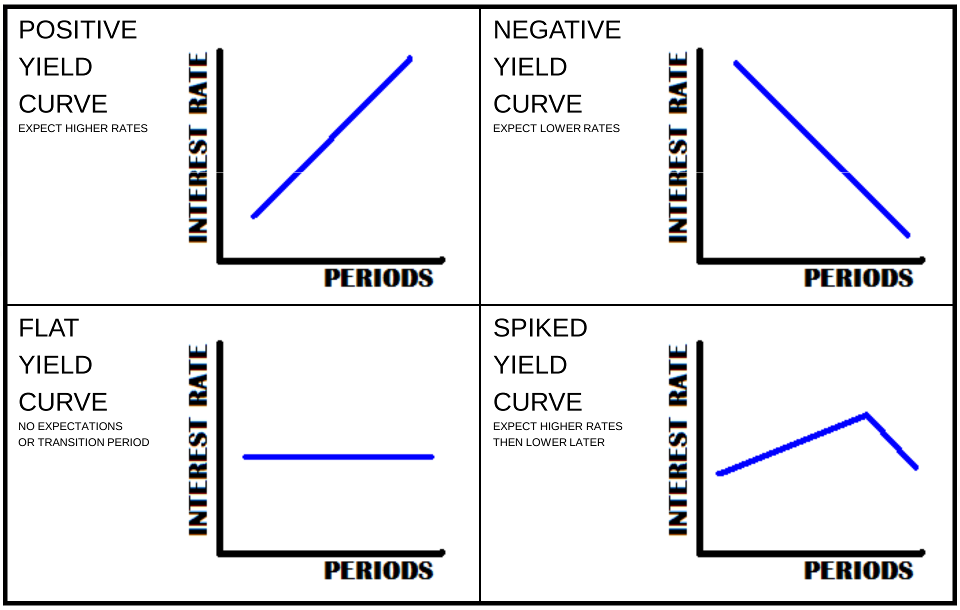

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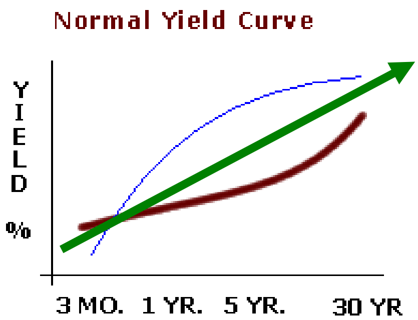
1/ Normal yield curve

The yield curve has been called "normal" when yields rise as maturity lengthens, that is, when the slope of the yield curve is **positive.**

This positive slope reflects investor expectations for the economy **to grow in the future** and, importantly, for this growth to be associated **with a greater risk that inflation** rises in the future than falls.



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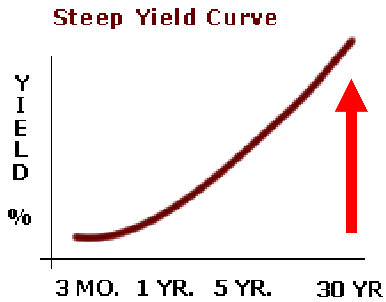
2/ Steep yield curve

The economy is expected to improve **quickly** in the future.

This type of curve can be seen at the beginning of an economic expansion (right after the end of a recession).

Here, economic stagnation will have depressed short-term interest rates; however, rates begin to rise once the demand for capital is re-established by growing economic activity.



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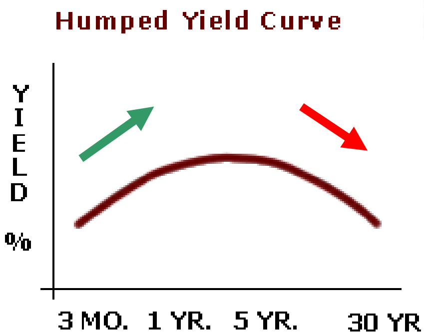
3/ Flat or humped yield curve

A flat curve is apparent when all maturities have same yields, whereas a humped curve results when short-term and long-term yields are equal and mid-term yields vary from those of the short-term and long-term.

A flat curve sends signals of uncertainty in the economy. This mixed signal can revert back to a normal curve or could later result into an inverted curve. *It cannot be explained by the Segmented Market theory.*



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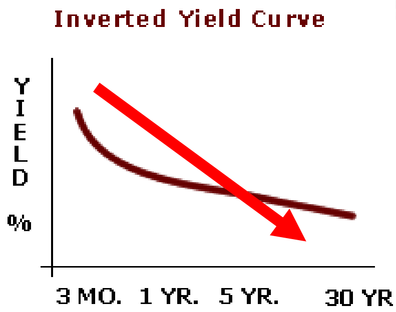
4/ Inverted yield curve

An inverted curve occurs when
long-term yields fall below short-term yields. Under this abnormal and contradictory situation, long-term investors will settle for lower yields now if they think the economy will slow or even decline in the future.

An inverted curve may indicate a ***worsening economic*** *situation in the future.*

In addition to potentially signaling an economic decline, inverted yield curves also imply that the market believes inflation will remain low.
This is because, even if there is a recession, a low bond yield will still be offset by low inflation.



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Theories

Market expectations
(pure expectations) hypothesis

1/ Market segmentation theory
2/ Liquidity preference theory
3/ Preferred habitat theory

$$(1+i_{lt})^n = (1+i_{st}^{year1})(1+i_{st}^{year2})\cdots(1+i_{st}^{yearn})$$

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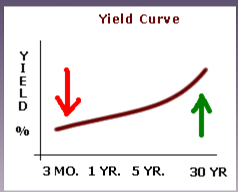

Curve notions

Market expectations (pure expectations) hypothesis

This hypothesis suggests that the shape of the yield curve is based on **market participants' expectations** of future interest rates.

1/ Market segmentation theory

In this theory, financial instruments of different terms are not substitutable.

As a result, the supply and demand in the markets for short-term and long-term instruments is determined independently.

.

2/ Liquidity preference theory

Asserts that long-term interest rates include **a premium for holding long-term bonds**, called the term premium or the **liquidity premium.**

3/ Preferred habitat theory

The Preferred Habitat Theory states that, in addition to interest rate expectations, **investors have distinct investment horizons** and require a meaningful premium to buy bonds with maturities outside **their "preferred" maturity, or habitat.**

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Construction of the full yield curve from market data

Typical inputs to the money market curve Type Settlement date Rate (%)

Typical inputs to the money market curve

Type	Settlement date	Rate (%)
Cash	Overnight rate	5.58675
Cash	Tomorrow next rate	5.59375
Cash	1m	5.625
Cash	3m	5.71875
Future	Dec-97	94.24
Future	Mar-98	94.23
Future	Jun-98	94.18
Future	Sep-98	94.12
Future	Dec-98	94.00
Swap	2y	6.01253
Swap	3y	6.10823
Swap	4y	6.16
Swap	5y	6.22
Swap	7y	6.32
Swap	10y	6.42
Swap	15y	6.56
Swap	20y	6.56
Swap	30y	6.56

A list of standard instruments used to build a money market yield curve.

The data is for lending in US dollar, taken from 6 October 1997

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The usual representation of the yield curve is a function P, defined on all future times t, such that P(t) represents the value today of receiving one unit of currency t years in the future.

If P is defined for all future t then we can easily recover the yield (i.e. the annualized interest rate) for borrowing money for that period of time via the formula

The significant difficulty in defining a yield curve therefore is to determine the function P(t).

P is called the discount factor function.

$$Y(t) = \left(\frac{1}{P(t)}\right)^{\frac{1}{t}} - 1$$

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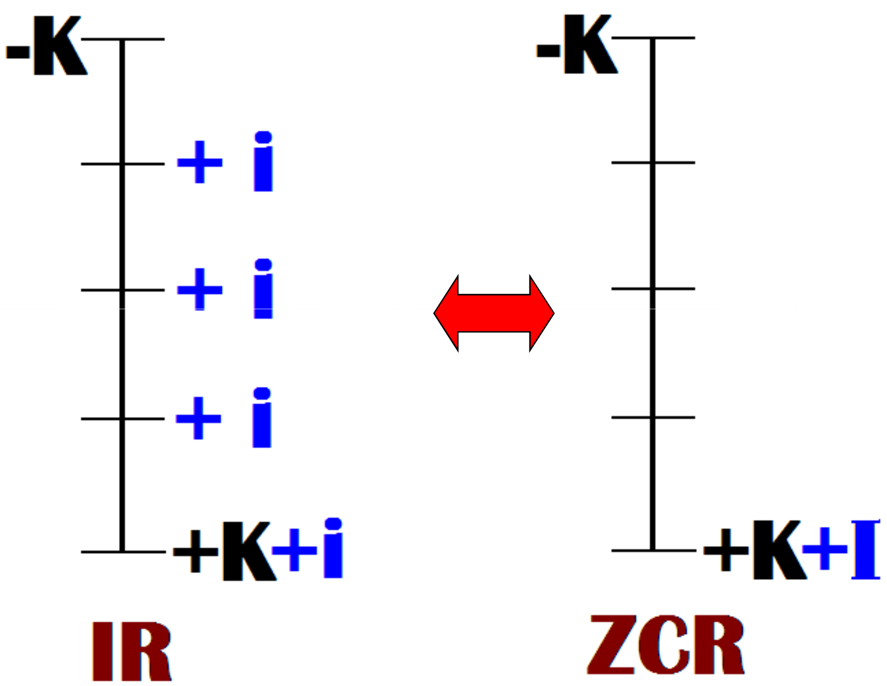
Interest Rates and Zero Coupon



Interest Rates and Zero Coupon

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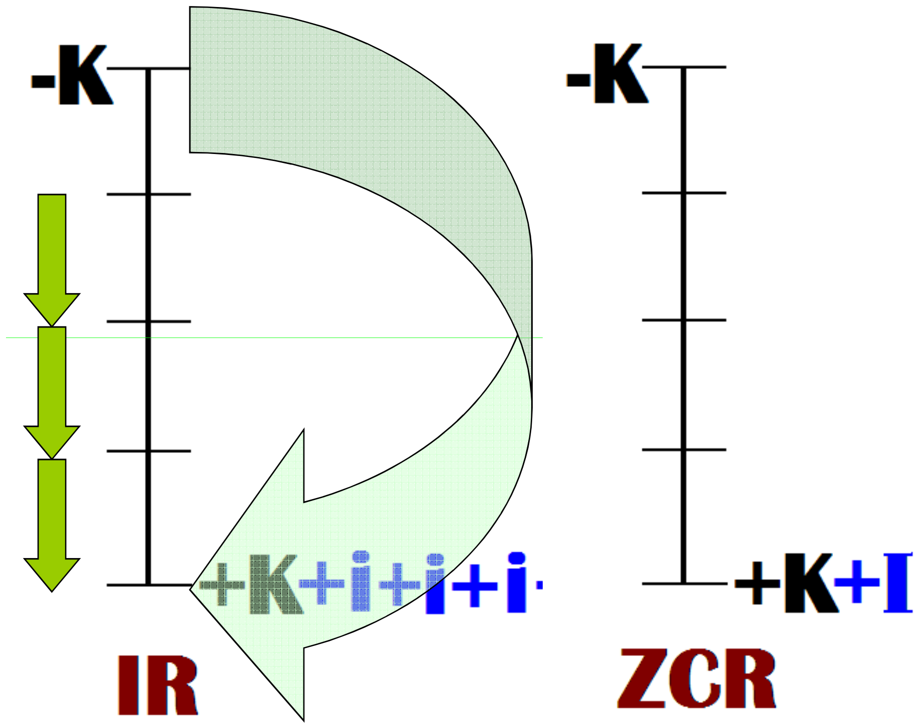

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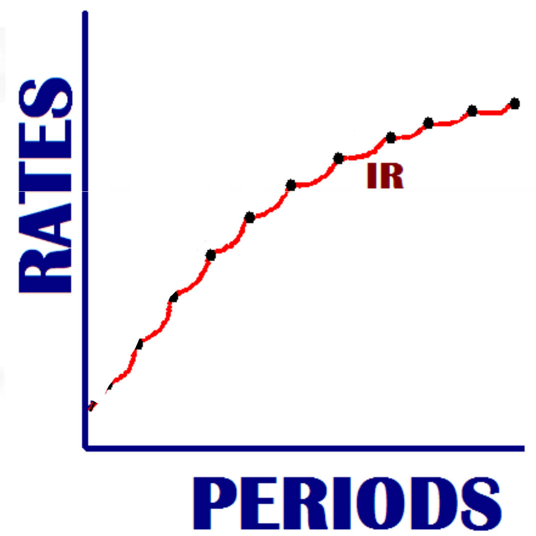

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Zero Coupon & Actualization

If a forward amount (FA) is calculated like :

$$FA = IA * (1 + APR)^n$$

Then

$$IA = \frac{FA}{(1 + APR)^n}$$

Where IA is the initial amount on n years and at the APR as annual percentage rate

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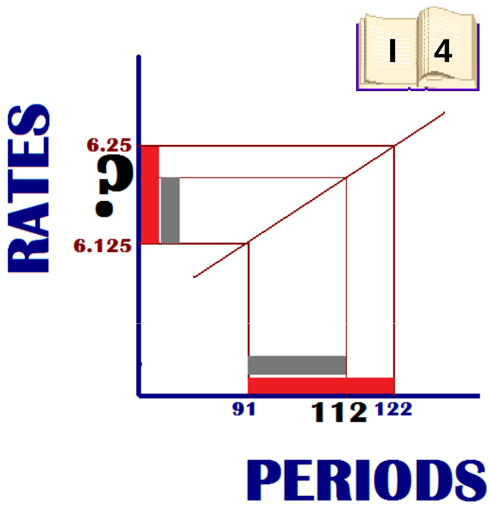
Interpolation (linear and curvilinear)

LINEAR :



BR=SR+(((BD-SD)/(LD-SD))*(LR-SR)

WHERE :

SD = SHORT DATES
SR = SHORT RATE
LD = LONG DATES
LR = LONG RATE
BD = BROKEN DATES
BR = BROKEN RATE

6.125 + (((112-91)/(122-91))*(6.25-6.125)) = 6.2097

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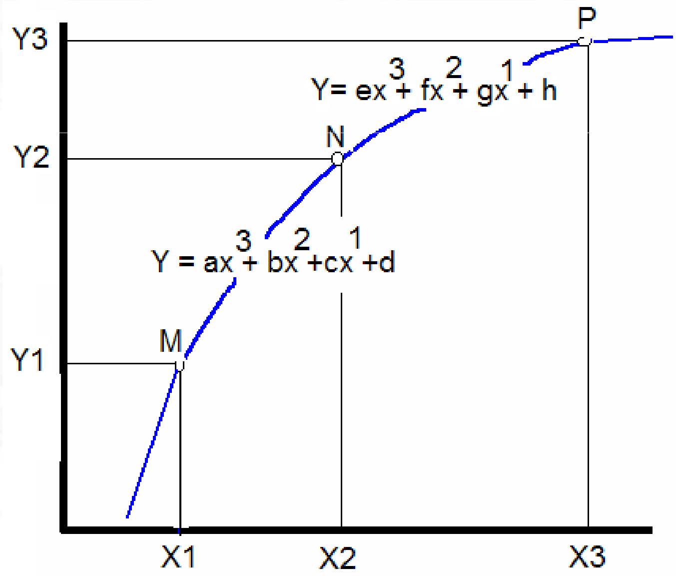
CURVILINEAR :

example : CUBIC SPINE LINE INTERPOLATION



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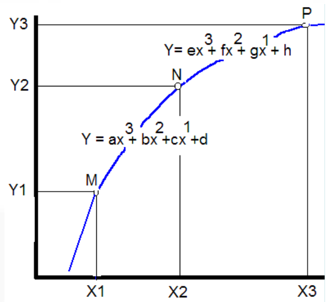
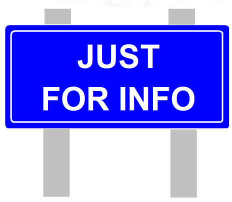
CUBIC SPINE LINE INTERPOLATION



The 8 equations are :

Y2 can be computed as solution of the 1st equation :
d+cX2+bX2^2+aX2^3 = Y2
Y2 can also be computed as solution of the 2nd equation :
h+gx2+fx2^2+ex2^3 = Y2
At N, the 1st derivative (tan) is the same, via equation 1 and 2
c+2bx2+3ax2^2 = g+2fx2+3ex2^2
At N, the 2nd derivative (convexity) is the same, via equation 1 and 2
2b+6ax2 = 2f+6ex2
For **X1**, the solution is Y1 exclusively via the 1st equation
d+cx1+bx1^2+ax1^3 = Y1
Before M, the trend remains the same as it is on t1
2b+6ax1 = 0
For **X3**, the solution is D3 exclusively via the 2nd equation
h+gx3+fx3^2+ex3^3 = Y3
After P, the trend remains the same as it is on t3
2f+6ex3 = 0



Syllabus
ACI Dealing Certificates

Chap. 2

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2. Cash Money Markets
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4. Forward-forwards, FRAs and Money Market Futures & Swaps
5. Options
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  - Definition
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- Repurchase Agreement

Chap. 2 : Cash Money Markets

Aim:

To understand the function of the money market, the differences and similarities between the major types of cash money market instrument and how they satisfy the requirements of different types of borrower and lender. To know how each type of instrument is quoted, the quotation, value date, maturity and payment conventions that apply and how to perform standard calculations using quoted prices. Given the greater inherent complexity of repo, a good working knowledge is required of its nature and mechanics.

Chap. 2 : Cash Money Markets

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Cash Money Markets

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CDs
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Definition
Calculation Method
Repurchase Agreement

Candidates should have a knowledge of:

- define the money market
- describe the main features of the basic types of cash money market instrument --- i.e. interbank deposits, bank bills or bankers' acceptances, treasury or central bank bills, commercial paper, certificates of deposit and repos --- in terms of whether or not they are securitised, transferable or secured; in which form they pay return (i.e. discount, interest or yield); how they are quoted; their method of issuance; minimum and maximum terms; and the typical borrowers/issuers and lenders/investors that use each type
- use generally-accepted terminology to describe the cash flows of each type of instrument
- understand basic dealing terminology as explained in The Model Code
- distinguish between and define what is meant by domestic, foreign and euro-(offshore) money markets, and describe the principal advantages of euro market money instruments
- describe the differences and similarities of classic repos and sell/buy-backs in terms of their legal, economic and operational characteristics
- define initial margin and margin maintenance
- list and outline the main types of custody arrangements in repo
- calculate the value of each type of instrument using quoted prices, including the secondary market value of transferable instruments
- calculate the present and future cash flows of a repo given the value of the collateral and an agreed initial margin
- define general collateral (GC) and specials
- describe what happens in a repo when income is paid on collateral during the term of the repo, in an event of default and in the event of a failure by one party to deliver collateral

Chap. 2 : Cash Money Markets

CHAP 2
Cash Money Markets

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Regarding papers, we will focus on money market negotiable papers :

- Short term **Government** papers
  (typology, tenders, formulas, quotations)

- **Bank** short term papers
  (Bankers' Acceptances, UK eligible bills, Certificates of Deposits)

- **Commercial** Papers
  (Euro Commercial Papers and US domestic Commercial Papers)

- Repurchase **Agreement**
  (Classic Repo and Sell and Buy Back contracts)

3 Calculation Method

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3 Main Calculation Methods for the Pricing of the Short Papers

discount, interest or yield

3 Calculation Method

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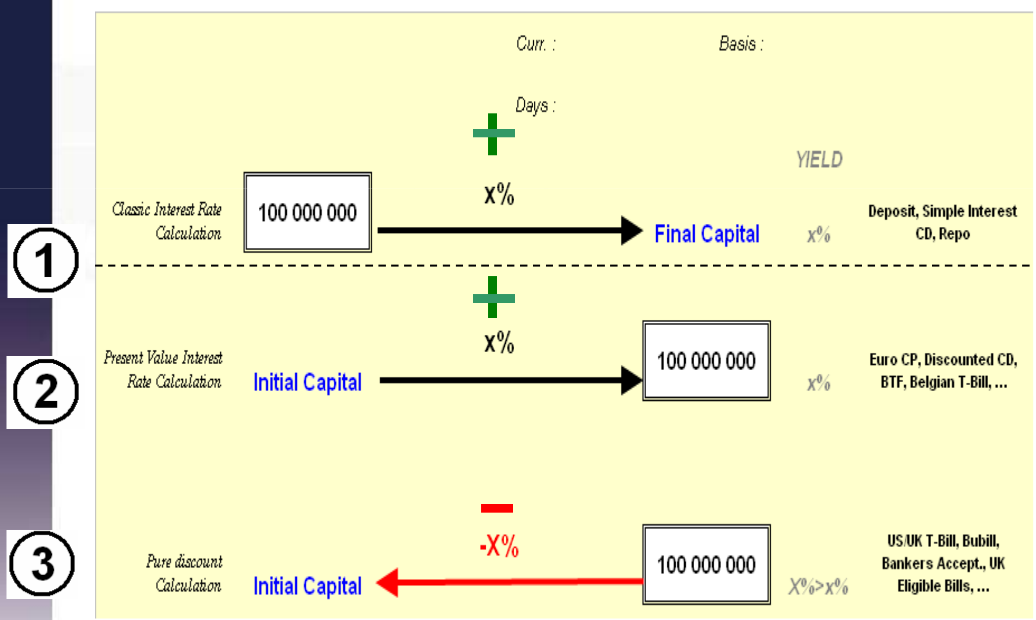

3 Calculation Method

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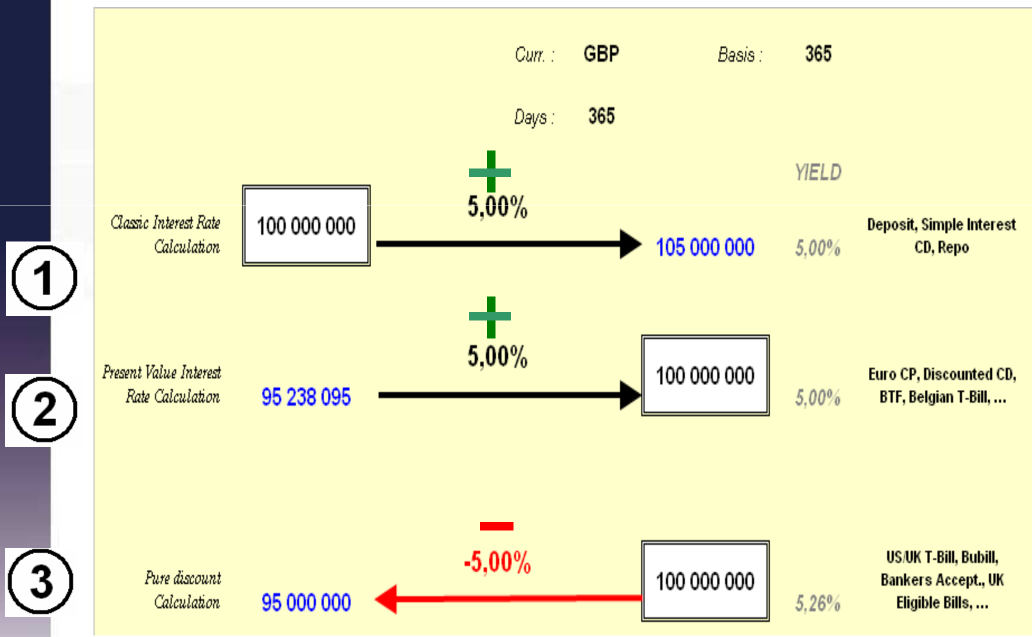

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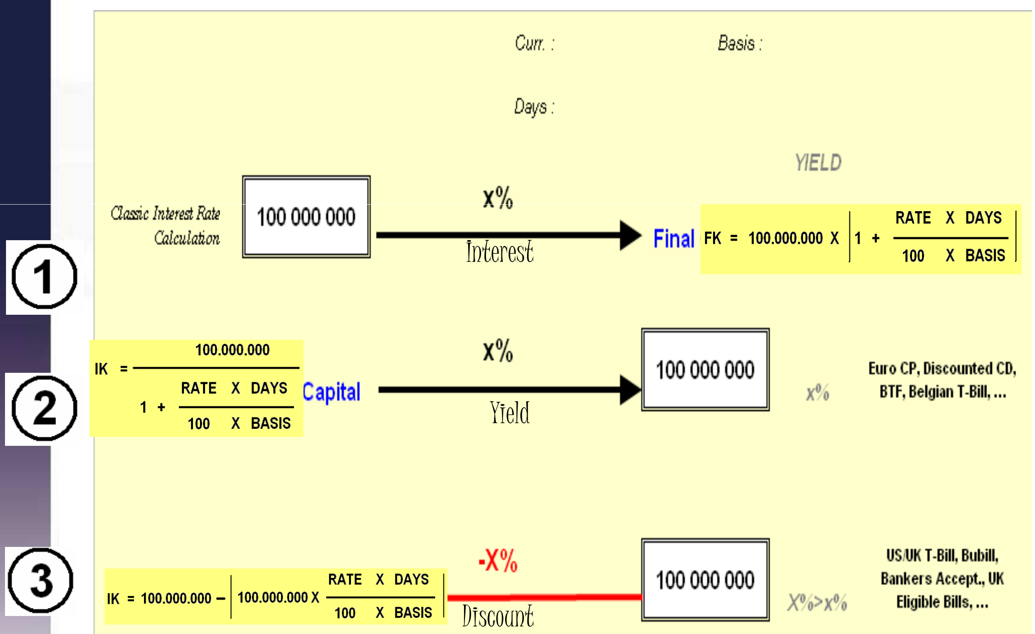

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Deposit and Loan

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1- Definition

A Pure Deposit Cash Interest Rate Operation simply consists in a transaction (retail and wholesale) between a borrower and a lender of a principal amount plus a fixed pre-agreed percentage paid at a fixed maturity.

- The lender has a full risk involvement on capital with the borrower.
- The deposit market's liquidity depends on the currency traded
- A fixed deposit is not renegotiable
  except if both parties agree on a penalty.

No collateral involved !

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Deposit & Loan

2- Calculation method

1

$$FK = 100.000.000 \times \left| 1 + \frac{RATE \times DAYS}{100 \times BASIS} \right|$$

3- Yield

Y = DR

Deposit Rates are expressed directly in YIELD

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Deposit & Loan

NO COLLATERAL INVOLVED

Spot Time

Maturity Time

+ Start Amount

Money Market Yield

– Final Amount

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Short Term Government Paper

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Short Term Government Paper

1- Definition

For the ACI Certificate, we focus only on short-term government debts (under 12 Months maturity)

The longer maturity debts are part of the Capital Market and not the Money Market (this is a subject addressed for the ACI Diploma but not for the ACI Dealing Certificate)

Short-term government papers exists in all the main currencies and have different names according to the issuance state :

Treasury Bill in the US

Treasury Bill in the UK

Bubills in Germany

BTF (Bons du Trésor Français) in France …

They are regularly issued for maturities of 1 Month, 3 Months, 6 Months or 12 Months

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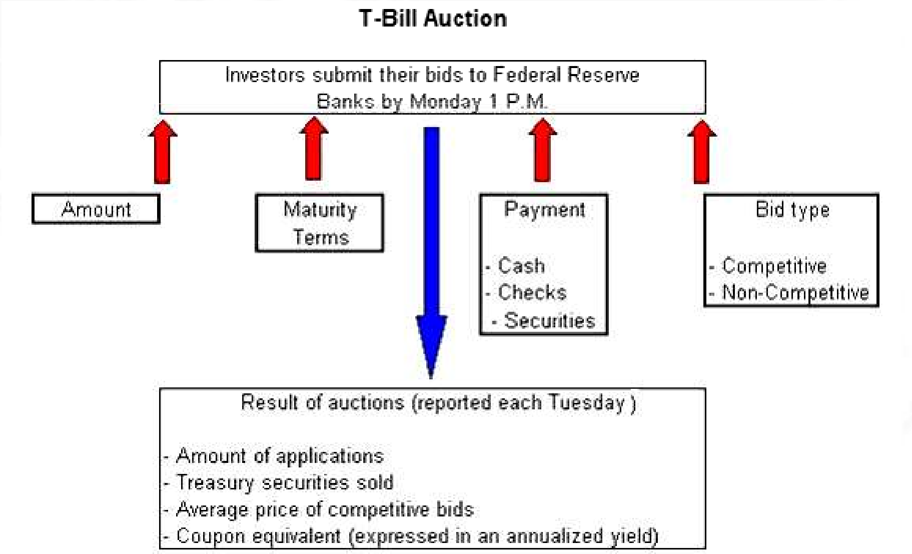
Short Term Government Paper

Most of the papers are issued on a competitive yield basis (often referred as **a Dutch tender**)

The global scheme for a US T-Bill tender is :



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Short Term Government Paper

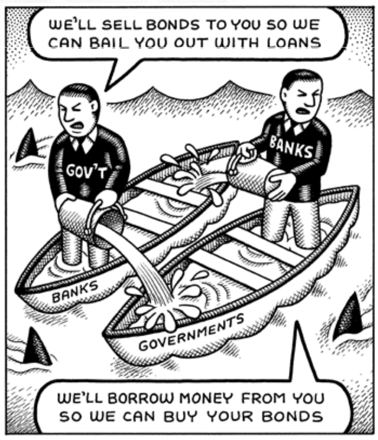
Taking the example of a US T-Bill tender where an amount of **100** is allocated :

3 Non-competitive bids :

- Bank H wants 20
- Bank G wants 10
- Bank F wants 15

5 Competitive bids :

- Bank E wants 15	at 4,909
- Bank D wants 15	at 4,940
- Bank C wants 25	at 4,972
- Bank B wants 25	at 5,077
- Bank A wants 20	at 5,119



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Taking the example of a US T-Bill tender where an amount of **100** is allocated :

Bank	Bid Type	Amount	Accumul.	Yield	Result	
A	Competitive	20	145	5,119	Not Taken	(1)
B	Competitive	25	125	5,077	Not Taken	
C	Competitive	25	100	4,972	Taken	(2)
D	Competitive	15	75	4,940	Taken	
E	Competitive	15	60	4,909	Taken	
F	Non Compet.	15	45	4,946	Accepted	(3)
G	Non Compet.	10	30	4,946	Accepted	
H	Non Compet.	20	20	4,946	Accepted	

Weighted average yield : 4,946 %

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Short Term Government Paper

2- Calculation method

Most of the short-term government papers are now traded as **Pure Discount operations (PDR)**

US, UK, GER, … **The others are still on true yield** 2

To calculate the price (issuance price and secondary market value), we use the following formula :

Secondary Market Proceeds (**SMP**)

$$\text{SMP} = \text{FV} * \left(1 - \left(\frac{\text{Pure Disc Rate} * \text{Days}}{100 * \text{Basis}}\right)\right)$$

3

$$\text{IK} = 100.000.000 - 100.000.000 \times \frac{\text{RATE} \times \text{DAYS}}{100 \times \text{BASIS}}$$

Short Term Government Paper

Other display according to the official ACI Formula

3

SMP = FV * (1 – (PDR * (D / (B*100))))

Where :

FV = face value

PDR = discount rate

D = number of days

B = currency basis

FORMULA AVAILABLE AT THE EXAMINATION

$$\text{secondary market proceeds} = \text{face value}\left(1 - \frac{\text{rate of discount x day count}}{\text{annual basis}}\right)$$

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To calculate the amount of discount :

$$\text{discount amount} = \text{face value}\ \frac{\text{rate of discount x day count}}{\text{annual basis}}$$

FORMULA AVAILABLE AT THE EXAMINATION

AMT DISC = FV * RD * D / (B *100)

Where :

FV = face value

RD = discount rate

D = number of days

B = currency basis

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A comment concerning the available formulas available for the exam :

Interest rates have to be entered in decimals

R / 100 = r
(4.85 % = 0.0485)

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Example :

What is the price of a **91** days UK T-Bill
having a rate of **4.65%** for **10** Millions GBP ?

Price = 10.000.000 * (1 – (4.65 * (91 / (365*100))))
= **9.884.068,49**

Example :

What is the amount of discount for a 91 days UK T-Bill having a rate of 4.65% for 10 Millions GBP ?

Amt of discount = 10.000.000 * 4.65 * 91 / (365 *100)
= **115.931,51**

Price = Face Value – Amount of discount
9.884.068,49 = 10.000.000 - 115.931,51

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3- Yield

The pure discount rate is obviously different from the yield to maturity

$$\text{true yield} = \frac{\text{rate of discount}}{1 - \dfrac{\text{rate of discount x day count}}{\text{annual basis}}}$$

The equivalency formula is :

Yield = **DR / (1 – (DR * (D / (B*100))))**

Where :

DR = discount rate
D = number of days
B = currency basis

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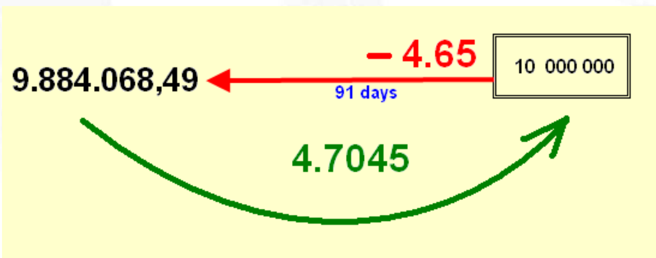
Example :

What is the yield of our 91 days UK T-Bill having a rate of **4.65**% ?

Yield = 4.65 / (1 – (4.65 * (91 / (365*100)))) = **4.7045** %

We can observe that the yield is always higher than the pure discount rate

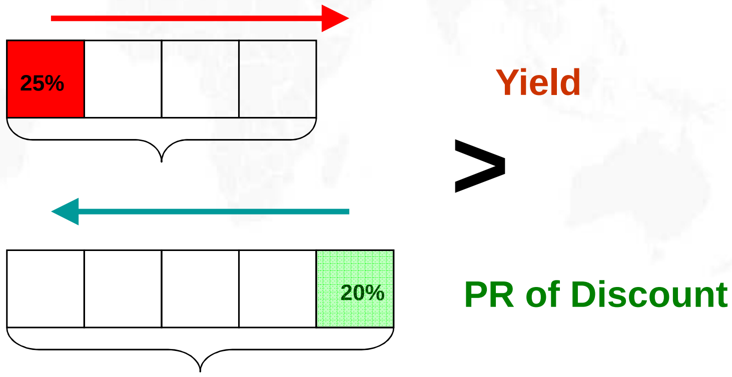


Short Term Government Paper

Why is the yield always greater than the pure discount rate ?

the pure discount rate can be seen as
the present value of the yield

the amount of discount can be reinvested for the period at the yield



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With our 91 days UK T-Bill, 4.65%, 10 Millions GBP we had
an amount of discount of 115.931,51 GBP
a yield of 4.7045404 %

A single deposit of 10 Millions GBP, 91 days at 4.7045404% would result in interests at maturity of :
10.000.000 * (4.7045404 * 91/(365*100)) =

117.291,28

This is equivalent to investing the originally received interests at the yield of 4.7045404 :
115.931,51 * (1 + (4.7045404 * (91 / (365 * 100)))) =

117.291,28

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Taking into account the full display of the tender
We can notice that :

Pure Discount Rate (PDR)

<

Annualised Yield (Y)

Bank	Bid Type	Amount	Accumul.	Yield	Pure Rate of Discount	PRICE	Result
A	Competitive	20	145	5,119	4,99	97.477	Not Taken
B	Competitive	25	125	5,077	4,95	97.498	Not Taken
C	Competitive	25	100	4,972	4,85	97.548	Taken
D	Competitive	15	75	4,940	4,82	97.563	Taken
E	Competitive	15	60	4,909	4,79	97.578	Taken
F	Non Compet.	15	45	4,946	4,825	97.561	Accepted
G	Non Compet.	10	30	4,946			Accepted
H	Non Compet.	20	20	4,946			Accepted

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In order to **check** if our results are good, we can manipulate the formulas a little bit :

To find the pure discount rate from a ***yield*** :

PDR = ((B * 100) * Y) / ((B * 100) + (Y * D))

Where :
Y = yield
D = number of days
B = currency basis

FORMULA NOT AVAILABLE AT THE EXAMINATION

To find the discount rate from a ***price*** *:*

PDR = (1 – (P / FV)) * ((B * 100) / D)

Where :
P = price
FV = face value

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Example :

With our 91 days UK T-Bill, 10 Millions GBP we had
a price of GBP 9.884.068,49
a yield of 4.7045 %

So, we have :

Discount Rate from Yield =

(36500 * 4.7045) / ((36500 + (4.7045 * 91)) = **4.65%**

Discount Rate from Price =

(1 – (9.884.068,49 / 10.000.000)) * (36500 / 91) = **4.65%**

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4- Secondary Market Proceed

The secondary market is very active for these short term papers

They can easily, thanks to the high liquidity, be sold or used for Repos

If a bank decides to resell the paper before maturity :

Example :

A bank buys a 91 days US T-Bill at a rate of 4.65 % for USD 10.000.000

After 31 days (60 days remaining), the bank sells the T-Bill at a rate of 4.71 %

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Cost of the 91 days US T-Bill at a rate of 4.65 % for USD 10.000.000

Price = **FV * (1 – (PDR * (D / (B*100))))**
= 10.000.000 * (1 - (4,65*(91/36000)))
= 9.882.458,33

Income after 31 days (60 days remaining) by selling the T-Bill at a rate of 4.71 %

SMP = **FV * (1 – (PDR * (D / (B*100))))**
= 10.000.000 * (1 - (4,71*(60/36000)))
= 9.921.500,00

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5- Yield achieved during the holding period

Knowing the 2 flows
- at the beginning of the holding period
- and the maturity of the holding period

We can easily compute the consequent yield during the holding period (Yield Achieved = YA)

$$FA = IA\ (1 + (\text{Yield} * \text{Days} / (\text{Base} * 100)))$$

So

$$YA = \left\{ \frac{FA}{IA} - 1 \right\} * \frac{\text{Base} * 100}{\text{Days}}$$

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$$YA = \left\{ \frac{FA}{IA} - 1 \right\} * \frac{Base * 100}{Days}$$

$$YA = \left\{ \frac{9.921.500,00}{9.882.458,33} - 1 \right\} * \frac{36000}{31}$$

$$YA = \mathbf{4,58779}$$

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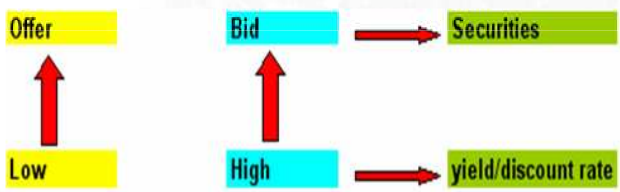
6- Quotation

We again have here the difference in quotations in the secondary market between western Europe, the US (we can say the international money market) and the UK :

In western Europe and the US (international money market generally speaking), we have :

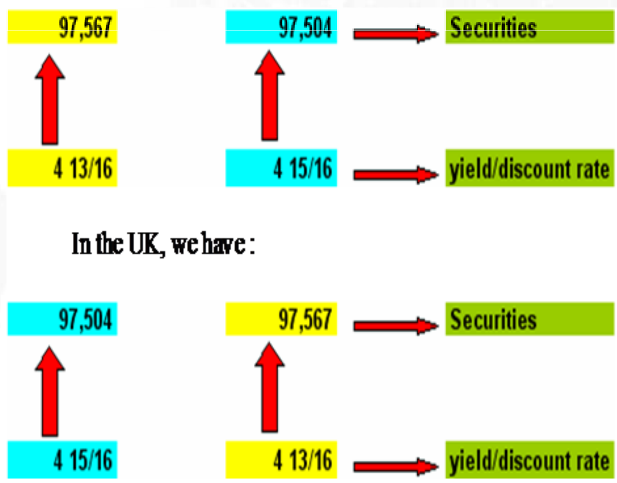


In the UK, we have :

Short Term Government Paper

Example of a 182 days US T-Bill, with a rate of 4 7/8 and a price of 97.535 :

In western Europe and the US (international money market generally speaking), we have :



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We will be talking about 3 main categories of Short Term Bank Paper

- Bankers' Acceptances
- UK Eligible Bills
- Certificate of Deposits (CDs)

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BANKERS'ACCEPTANCE

1- Definition

Bankers' acceptance is a bill of exchange guaranteed by a **BANK**

Bills of exchange come from the commercial sector

The **BANK** that guarantees the bill will repay it at maturity

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BANKERS'ACCEPTANCE

2- Calculation method

Bankers Acceptance are traded as **Pure Discount operations (PDR)**

To calculate the price (issuance price and secondary market value), we use the following formula :

Secondary Market Proceeds (**SMP**)

$$SMP = FV * \left(1 - \left(\frac{\text{Pure Disc Rate} * \text{Days}}{100 * \text{Basis}}\right)\right)$$

3

$$IK = 100.000.000 - \left| 100.000.000 \text{ X } \frac{\text{RATE X DAYS}}{\text{100 X BASIS}} \right|$$

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UK ELIGIBLE BILLS

1- Definition

In the UK, some accepted bills of exchange are called Eligible Bills. These special bills can be **re-discounted directly at the Bank of England**

So, they are **risk free papers**

To obtain the status of Eligible Bill, the Bank of England clearly stipulates conditions

(the bank accepting the Bill has to belong to a special list, the company can't issue a bill for more than 187 days…)

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UK ELIGIBLE BILLS

2- Calculation method

UK Eligible Bills are traded as **Pure Discount operations (PDR)**

To calculate the price (issuance price and secondary market value), we use the following formula :

Secondary Market Proceeds (**SMP**)

$$SMP = FV * \left(1 - \left(\frac{\text{Pure Disc Rate} * \text{Days}}{100 * \text{Basis}}\right)\right)$$

3

$$IK = 100.000.000 - \left| 100.000.000 \times \frac{RATE \times DAYS}{100 \times BASIS} \right|$$

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Repurchase Agreement

CERTIFICATES OF DEPOSIT

1- Definition

A CD is a paper issued by a bank **in the interbank money market**

Mainly, CDs have a maturity of between 30 days to 6 months

Longer term CDs with variable rates also exist

(but are seldom seen)

Principle of a CD = same than a cash deal but it's a negotiable paper

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CERTIFICATES OF DEPOSIT

2- Calculation method

Just like classic deposit
CDs are simple interest bearing instruments

1 $$FK = 100.000.000 \times \left[1 + \frac{RATE \times DAYS}{100 \times BASIS} \right]$$

Nevertheless, it also exists some discount CDs (seldom seen) : they are then computed on a **discounted basis** 2

ATF LUXEMBOURG
Short Term Bank Paper

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3- Types

A EURO CD is a CD :

which is issued by a bank in a currency whereas the bank is not a resident of the country of the currency (it has nothing to do with the euro zone)

Example : a Japanese bank based in Tokyo issues a CD in USD : this is a euro CD

A DOMESTIC CD is a CD :

which is issued by a bank in a currency whereas the bank is a resident of the country of the currency

Example : a Japanese bank based in Tokyo issues a CD in JPY : this is a domestic CD

(this definitions also apply to other instruments like bonds, Commercial Papers…)

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4- Secondary Market Proceed

As the CD can be sold before maturity, we need to find the secondary market proceed :

$$SMP = \frac{MP}{1 + \left(\frac{\text{Yield} \ * \ \text{Remaining Days}}{100 \ * \ \text{Basis}}\right)} \quad (2)$$

With :

SMP = secondary market proceed
MP = proceed at maturity
Y = Yield
RD = remaining number of days (day count)
B = currency basis

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$$\text{secondary market proceeds} = \frac{\text{proceeds at maturity}}{1 + \frac{\text{yield x day count}}{\text{annual basis}}}$$

(2)

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Example :

Bank B purchases a **91 days** EUR CD with a rate of **2.96%** from bank A, for EUR 10 Millions

After 30 days, Bank B sells the CD to bank C :

The **yield** in the market for the remaining **61 days** is

2.90%

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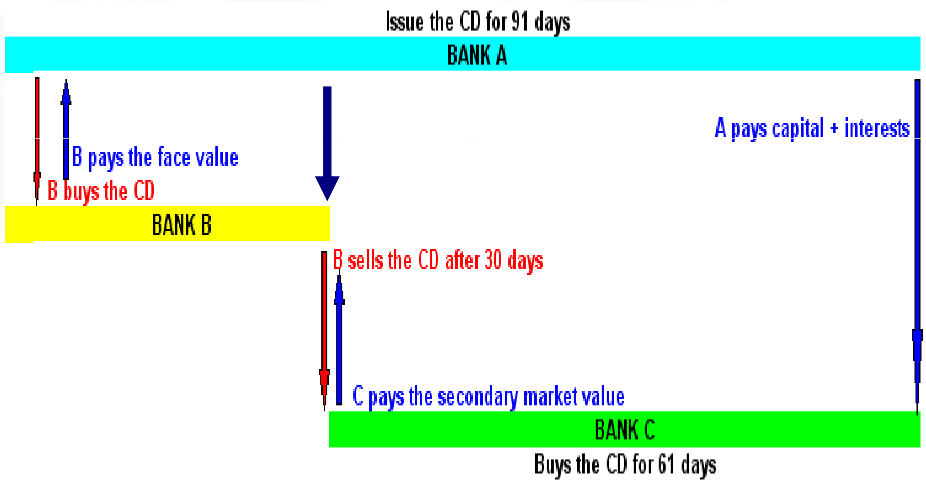

CERTIFICATES OF DEPOSIT

To find the secondary market value, we need first to find the maturity proceeds :

MP = 10.000.000 * (1 + (2.96 * (91 / (360*100))))
= **10.074.822,22**

Then we need to apply our new discounting yield :

SMP = 10.074.822,22 / (1 + (2.9 * (61 / (360*100))))
= **10.025.557.75**

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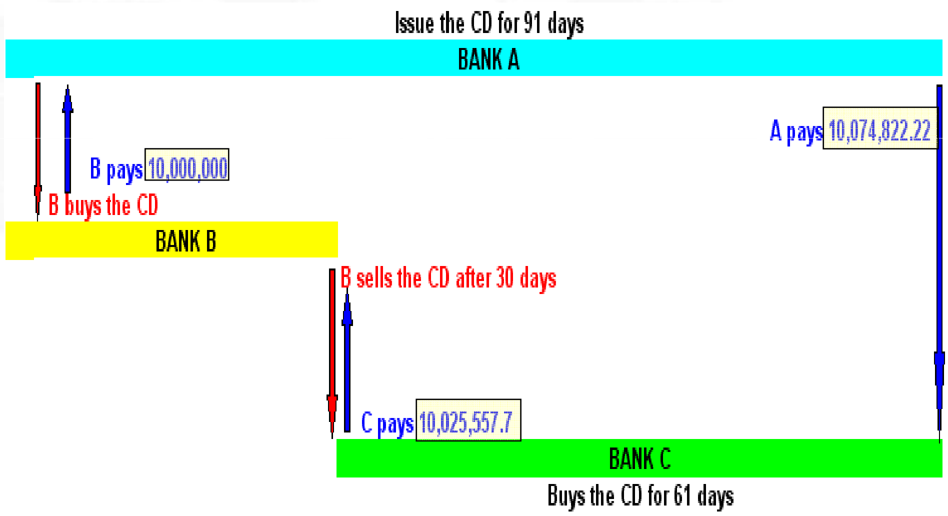

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CERTIFICATES OF DEPOSIT

5- Yield achieved during the holding period

Knowing the 2 flows

- at the beginning of the holding period

10.000.000,00

- and the maturity of the holding period

10.025.557,75

We can easily compute the consequent yield during the holding period (Yield Achieved = YA)

So

$$YA = \left\{ \frac{FA}{IA} - 1 \right\} * \frac{Base * 100}{Days}$$

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$$YA = \left\{ \frac{10.025.557,75}{10.000.000,00} - 1 \right\} * \frac{36000}{30}$$

$$YA = \mathbf{3.0669\ \%}$$

(it is logical here that Bank B has achieved a better return than the original 2.96% : the rates went down during the holding period and so Bank B sold its CD at a higher price compared with the purchasing price)

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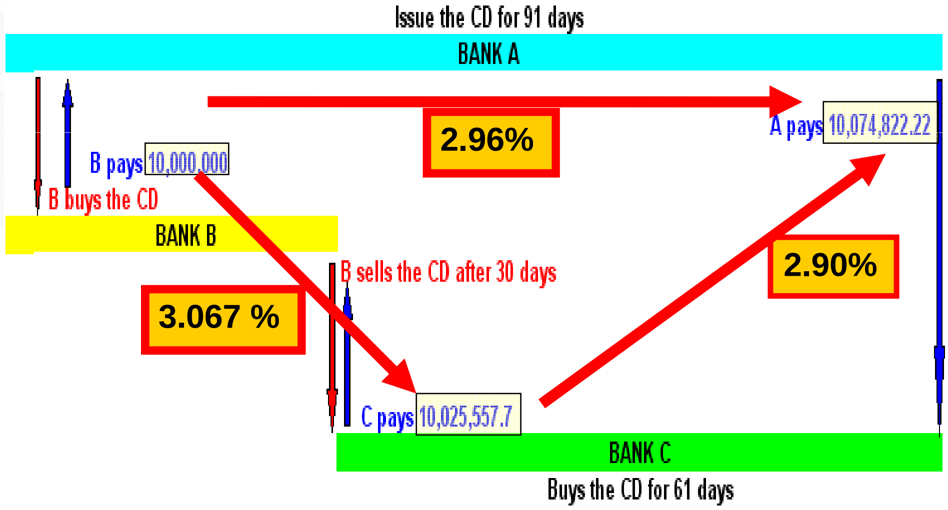

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CERTIFICATES OF DEPOSIT

Compared with a straight deposit :

- ***Main advantage*** : the negotiable aspect for the lender (you can resell the CD prior to maturity)

- ***Main problem*** = cash deposit = 100% impact on the credit line and so full credit risk exposure

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1- Definition

Short term debt (< 12 months) :
Issued by large companies and financial institutions (CDs = bank products)

Can be marketed :

- directly by companies to avoid banking fees
- through banks (acting as brokers)

Commercial Paper

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Secondary market almost non existent

Very large issues not uncommon

Usually, company need to have a rating in order to be able to market their paper

Floating rate CPs : marginal aspect

In term of credit risk, it is **riskier** than a CD or a Bankers' acceptance :

the CD and BA are guaranteed **by a bank** but

the **CP** only guaranteed **by a big company**

Commercial Paper

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2- Calculation method

a) CP on EUR, GBP, euro USD, all currencies, …

2

$$IK = \frac{100.000.000}{1 + \dfrac{RATE \times DAYS}{100 \times BASIS}}$$

b) CP on **Domestic USD**

3

$$IK = 100.000.000 - \left| 100.000.000 \times \frac{RATE \times DAYS}{100 \times BASIS} \right|$$

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Commercial Paper

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Calculation method for CP (except for US Domestic CP)
Is the present value approach

$$\text{secondary market proceeds} = \frac{\text{face value}}{1 + \dfrac{\text{yield x day count}}{\text{annual basis}}}$$

FORMULA AVAILABLE AT THE EXAMINATION

The price for a discounted CP

on a true yield basis is :

2 $\boxed{\textbf{IP = FV / (1 + (Y * (D/(B*100))))}}$

with

IP = issue price
FV = Face value
Y = yield
D = exact number of days
B = currency basis

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Exemples : II 1 to II 9

a) An Italian insurance company markets a 31 days CP
The capital repaid at the end is **1.000.000** **EUR**
The CP interest rate is 3 %.
The issue price for investors is :
IP = 1.000.000 / (1 + (3 * (31/36000)))) 2
= **997.423,32** EUR

b) An American pharmaceutical company markets a 62 days domestic CP
The capital repaid at the end is **1.000.000** **USD**.
The CP interest rate is 4 3/4 %.
The issue price for investors is :
IP = 1.000.000 * (1 - (4.75 * (62/36000)))) 3
= **991.819.44** USD

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Global Summary

Deposit, CD → (1)

$$MP = FV * \left(1 + \frac{Rate * Days}{100 * Basis}\right)$$

CD → (1)

$$SMP = \frac{MP}{1 + \left(\frac{Yield * Remaining\ Days}{100 * Basis}\right)}$$

CP *(except Dom USD)*, ST Govies *(BTF,Belgian,...)* → (2)

$$ISSUE\ PRICE = \frac{FACE\ VALUE}{1 + \left(\frac{Yield * Days}{100 * Basis}\right)}$$

ST Govies *(UK,US,Ger,...)*, Dom USD CP, Bankers'Acc., UK Elligible Bills → (3)

$$SMP = FV * \left(1 - \frac{Pure\ Disc\ Rate * Days}{100 * Basis}\right)$$

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REPURCHASE AGREEMENT

THE
REPO

REPURCHASE AGREEMENT

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   4. Quotation

2. Types
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Principle

A Repurchase Agreement (Repo in the SBB approach) is

- an agreement
- between two parties
- whereby one party sells the other a security
- at a specified price
- with a commitment to buy the security back
- at a later date
- for another specified price.

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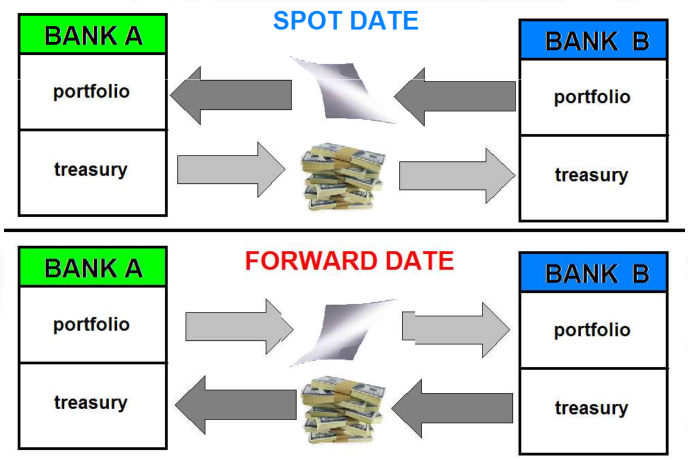
Types of movement



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Principle

Activities

According to ISMA, the amount of repo exceeded, in 2008, over **10.000 billion USD**, primarily in the very short term (*less than three months*).

Approximately 45% were made out in dollars and slightly less were it in EUR.

Most repos are overnight transactions, with the sale taking place one day and being reversed the next day.

Long-term repos (*called term repos*) can extend for a month or more.

Usually, repos are for a fixed period of time, but open-ended deals are also possible.

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Repo and Reverse repo

The party who sells and later repurchases a security is said to perform a **repo**.
(so receive the cash during the repo period)

The other party (who purchases and later resells the security) is said to perform a **reverse repo**.
(so receive the PAPER during the repo period)

A trader looking to borrow money is transacting a repo, while a trader looking to obtain securities is executing a reverse repo. When a customer provides money to a trader in return for securities, the transaction is often termed a repo by both parties.

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Motivation

MOTIVATION TO PERFORM A REPO

For the customer, a repo is an opportunity to invest cash - for a **custom period** of time (other investments typically involve whole numbers of months).

- It is a short-term and **secure investment**; in return for investing, the customer receives collateral.

- Market liquidity for repos is good and **yields are competitive** for investors.

For the trader, repos are used to finance long positions and **reduce funding costs** of other speculative investments.

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Risk

RISK BY PERFORMING A REPO

There is a small credit risk with using repos. It is essentially a **collateralized borrowing**; but it is possible that the borrower of cash may fail to repurchase the securities sold at the promised date (in other words, default).

In this case the lender may keep the security, but it may have lost value since the original transaction date.

To prevent this minor amount of credit risk, some repos are over-collateralized. The credit risk is directly associated with the maturity of the repo: *the longer the maturity, the greater the credit risk coming with the repo.*

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Quotation

REPO QUOTATION :

Always in terms of **INTEREST RATE**.

	Low	-	*High*	*interest rate*
Ex. :	3.14	-	3.18	
	OFFER	-	*BID*	*of the securities*

Careful : Just the opposite for London MM quotations

Contract

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TYPES OF CONTRACT

1- CLASSIC REPO

2- SELL & BUY BACK

3- SECURITY LENDING

Contract

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CLASSIC REPO *(US Style)*

- Legal contract

  A bilateral agreement has to be signed by the parties (**G**lobal **M**aster **R**epurchase **A**greement) produced by the **I**nternational **S**ecurities **M**arket **A**ssociation and the Bond Market Association (former **P**ublic **S**ecurities **A**ssociation)

- Transfer of title of the securities to the buyer

- Risk & Coupon **remains with the seller**
  (original owner of the security)

- Initial (Haircut)
  and variation Margin (Re-margining)

  In case of significant market expectations or actual changes, the value of the guaranty could be reduced and would justify a "call margin"

- Equivalent securities at maturity

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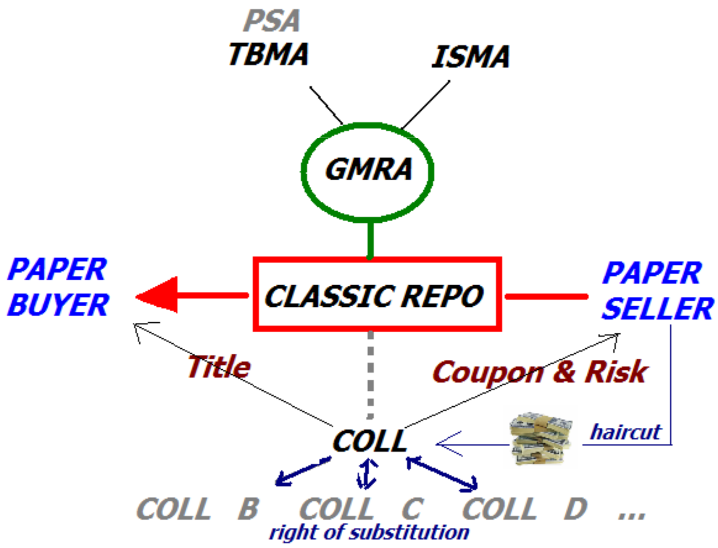

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CLASSIC REPO

The sale and repurchase prices are the same,

although

settlement values will differ because of addition of repo interest on termination

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SELL & BUY BACK

- No specific contract TBMA/ISMA
- Transfer of Title, Risk & Coupon of the securities
- Same securities at maturity

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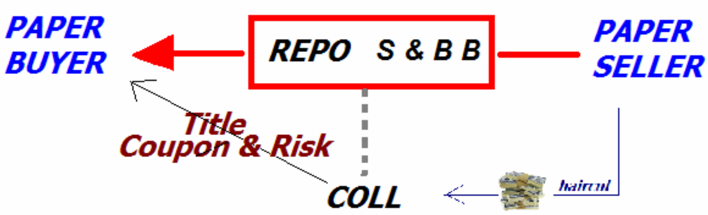

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SECURITY LENDING

Two securities are swapped for a certain period of time

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Contract

	REPO	SELL/BUY BACK
PURCHASE & SALE	■	■
MARGIN MAINTENANCE	■	
COUPON PASSED	■	
COUPON ADDED TO END PRICE		■
SUBSTITUTION	■	
INDUSTRY-APPROVED CONTRACT	■	

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Presentation

Comparison (pricing)

Classic Repo

1 Spot Dirty Price → SDP **+ Repo Interest**

Sell/Buy Back

Spot Dirty Price → Mat Dirty Price pre-agreed

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Maturities

TYPES OF REPO MATURITIES

There are three types of repo maturities:

- **Short dated Repo** refers to less than 1 mth maturity transaction (2/3 of the repos)
- **Term Repo** refers to a repo with a specified end date longer than 1 mth.
- **Open Repo** (or demand repo) simply has no prefixed end date. The rate is “rolled” over until one of the parties stop the deal.

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Central Banks Operations

AS CENTRAL BANKS OLD TOOL

Ex. US REPO Market

Central Banks frequently use repos to alter supply of cash to commercial banks, thereby influencing the level of interest rates.

SYSTEM REPO :
When the market is short of cash (Mkt sells Paper -> Repo)

MATCHED SALES :
When the market is long of cash (Mkt buys Paper -> Reverse Repo)

CUSTOMER REPOS :
When a Central Bank effects repos on behalf of other central banks

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TYPES OF PAPER "REPOED"

1- GENERAL COLLATERAL (GC)

When the paper used for the repo transaction is a "common" government paper
IN THE EUROZONE WE TALK ABOUT **EUREPO**

2- SPECIAL

*When the paper used for the repo transaction is a paper temporally attractive for various reasons (**ex. cheapest to deliver phenomena).** The value of the repo will be directly affected by the particularity of this collateral. Notice that a GC can become a Special for a limited period of time and vice versa.*

3- SPECIFIC

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Short term collateral Pricing

Example : *(simple simulation of a secondary market)*

What is the price of a 91 days UK T-Bill having a rate of 4.65% for 10 Millions GBP ?

Price = 10.000.000 * (1 – (4.65 * (91 / (365*100))))
= **9.884.068,49**

If Repo Yield at 4,5 % on 1 week (7 days)
Using this paper as collateral

Forward Price = 9.884.068,49 * (1+(4,5*7/36500))
= **9.892.598,57**

So the theoretical rate for the 84 residual days is 4,6668 %

Let's check **9.892.598,57** =? 10.000.000 * (1 – (4.6668 * (84 / (365*100))))

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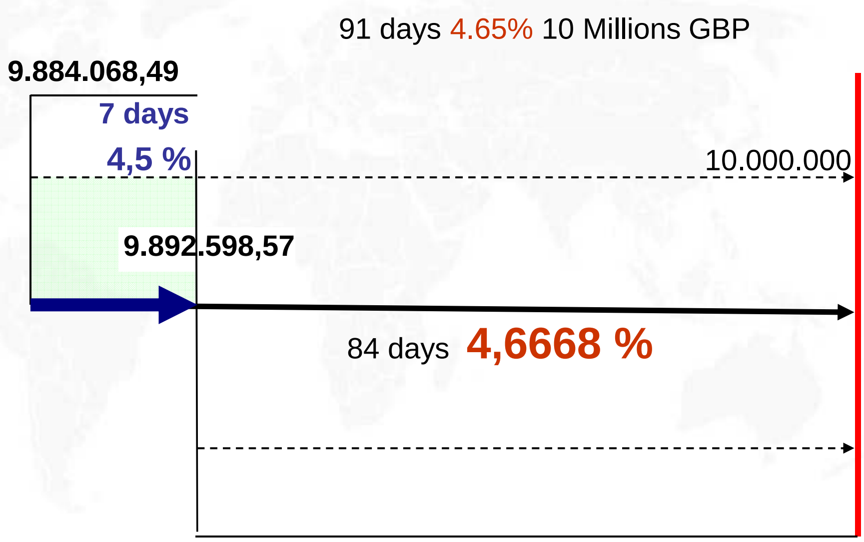
Short term collateral Pricing



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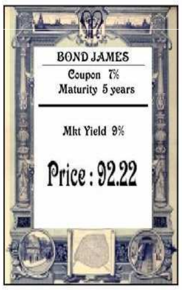
Long term collateral Pricing

THE BOND MARKET



FUNDAMENTAL COMPUTATIONS
VALUE OF A BOND : PRICING EXAMPLE

Using the general formula :

Price = (7 / ((1,09)^1)) + (7 / ((1,09)^2)) + (7 / ((1,09)^3))
+ (7 / ((1,09)^4)) + (107 / ((1,09)^5))

Price = 6.42 + 5.89 + 5.41 + 4.96 + 69.54

Price = 92, 22

Which means that to purchase for 1.000 € in nominal, one's has to expand 922,20 €.

ATF LUXEMBOURG

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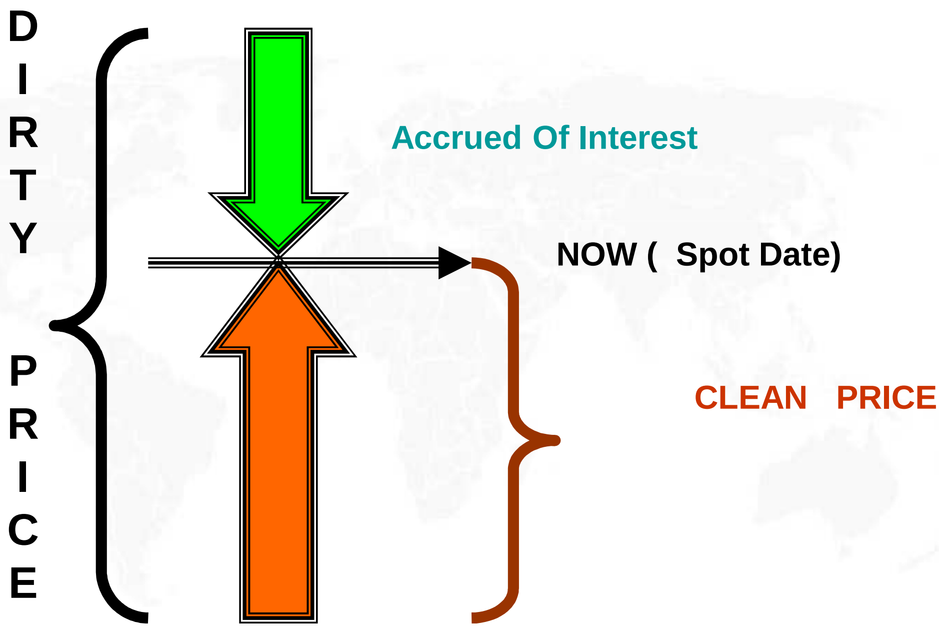
BOND PRICES



LUXEMBOURG

Bond Pricing

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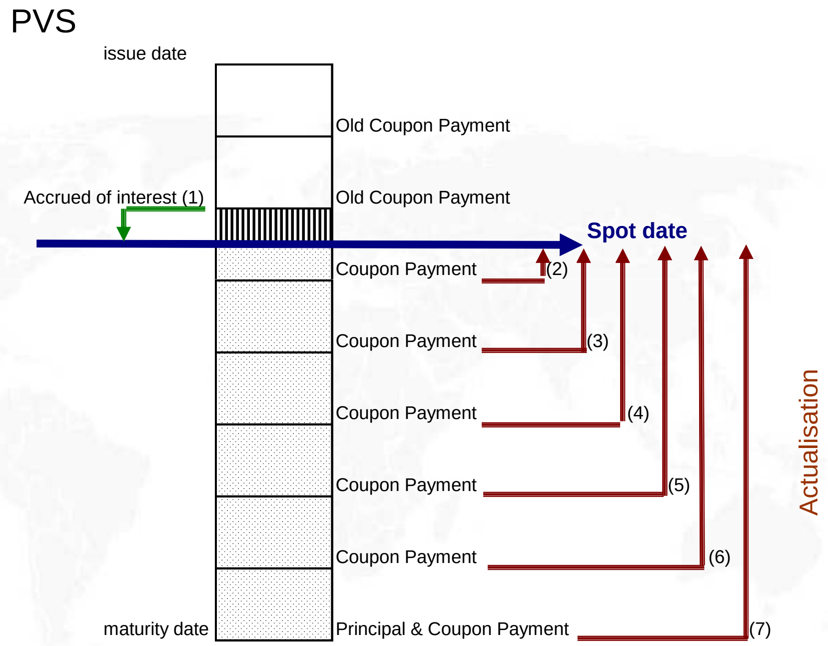

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BOND PRICES

CLEAN PRICE :
Market price in percentage of the Nominal

ACCRUED OF INTEREST :
Part of the coupon since the last payment (Care Basis)

DIRTY PRICE :
Addition of the clean price and the accrued of interests

ATF LUXEMBOURG

Bond Pricing

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CLEAN PRICE (%)

$$\text{Price (\%)} = \frac{\sum_{t=1}^{n} \frac{CFt}{(1+zrt)^{t}}}{\text{Nominal}}$$

where :
CFt = Cash flows at the time t
zrt = interest rate (zero) at the time t

ATF LUXEMBOURG

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ACCRUED OF INTEREST

$$AI = \text{Nominal} * \frac{\text{COUP} * \text{Last Bd DAYS}}{\text{Bond Basis}}$$

where :
Last Bd Days = Nb of Bd days since the last payment of Coupon
Bond Basis = Bond Basis linked to the specific paper

ATF LUXEMBOURG

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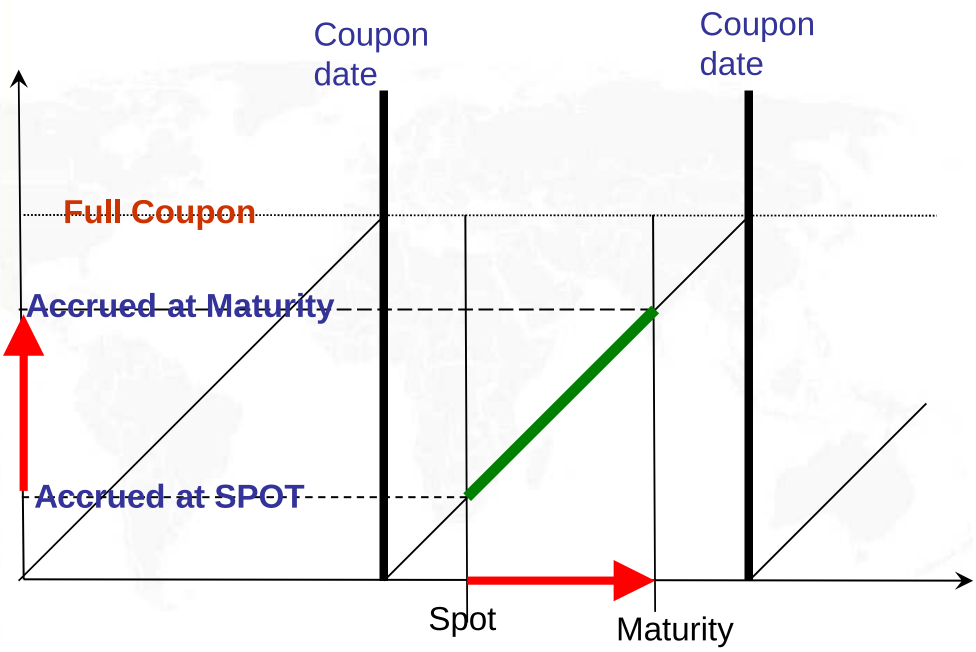
ACCRUED OF INTEREST



ATF LUXEMBOURG

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Example 1

Value date : 07/07/2003
Interest Rate target : 2.04 %
Spot GC Clean Price : 101.88 (C=8%)
Cash Period : 184 days
Maturity of the PVS Bd : 29 april 2006
Nominal Amount : 200.000.000 EUR

Examples of Pricing

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II 10 -A-

REPO ON LG TERM GOV

Cash details		*Paper details*	
Initial amount	200,000,000		
Value of the trade	07/07/03	Paper Price	101.88
Days of the period	184	Coupon	8
Maturity	07/01/04	Last coup. payment	29/04/03
Interest Rate expected	2.04	Maturity	29/04/06

	spot		maturity
Value	07-Jul-03		07/01/04
Amount	200,000,000		200,000,000
Price	101.88		98.96
Principal	203,760,000		197,916,049
Days of interest	68		248
Interest	3,022,222		11,022,222
Total	206,782,222 at	2.04	208,938,272

Final Consideration

Margin

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INITIAL MARGIN & MARGIN CALL

CURR STL

Cash details		*Paper details*	
Initial amount	1.000.000,00		
Value of the trade	18/12/2006	Paper Price	112,00
Days of the period	62	Coupon	7,00
Maturity	18/02/2007	Last coup. payment	29/06/2006
Interest Rate expected	4,25	Maturity	29/06/2010
BASE CURR	365		

	spot	maturity
Value	18/12/2006	
Amount	1.000.000,00	
Price	112,00	
Principal	1.120.000,00	
Days of interest	169	
Interest	32.861	
Total	**1.152.861,11**	

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Margin

INITIAL MARGIN & MARGIN CALL

The original "starting amount" was £ 1.152.861,11

Linked to ,

- Or the poor quality of the collateral or the counterparty,
- Or the volatility, sensitivity (so the risk) of this bond
- Or simply the legal convention

The lender of the cash will ask for an INITIAL MARGIN (Haircut) of for example 2.5 % on this amount.

So the cash amount actually lend will

$$\frac{£\ 1.152.861,11}{1+ 2.5\ \%} = 1.124.742,55 \Rightarrow £\ 1.124.700 \text{ rounded}$$

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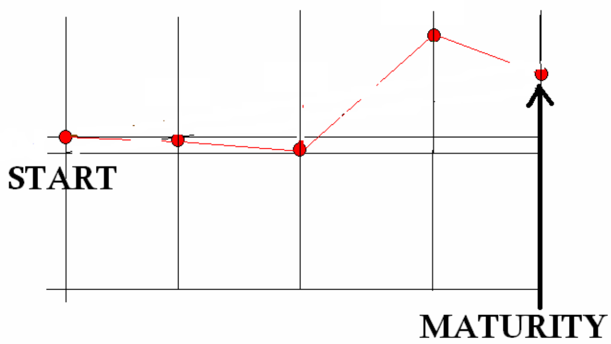
Margin

INITIAL MARGIN & MARGIN CALL

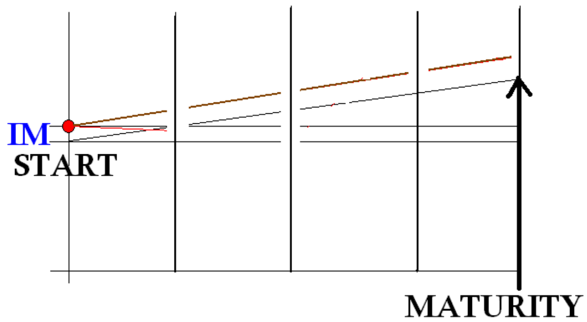
REAL MARKET CONDITIONS

	PRICE	bd day	ACCRUED	ALLIN
18/12/2006	112,00%	169	3,28611%	115,28611%
3/01/2007	111,00%	184	3,57778%	114,57778%
18/01/2007	109,00%	199	3,86944%	112,86944%
3/02/2007	113,00%	214	4,16111%	117,16111%
18/02/2007	111,00%	229	4,45278%	115,45278%



INITIAL MARGIN & MARGIN CALL

CLASSIC REPO CONVENTION TRADE AMOUNT					
2,50%				**2,50%**	
WITH INITIAL MARGIN		repo int accr	TOTAL	CUR MARGE	TOT
112,470%	0	0,00000%	112,470%		115,28175%
112,470%	16	0,20953%	112,680%		115,49652%
112,470%	31	0,40597%	112,876%		115,69787%
112,470%	47	0,61550%	113,086%		115,91264%
112,470%	62	0,81194%	113,282%		116,11399%



Margin

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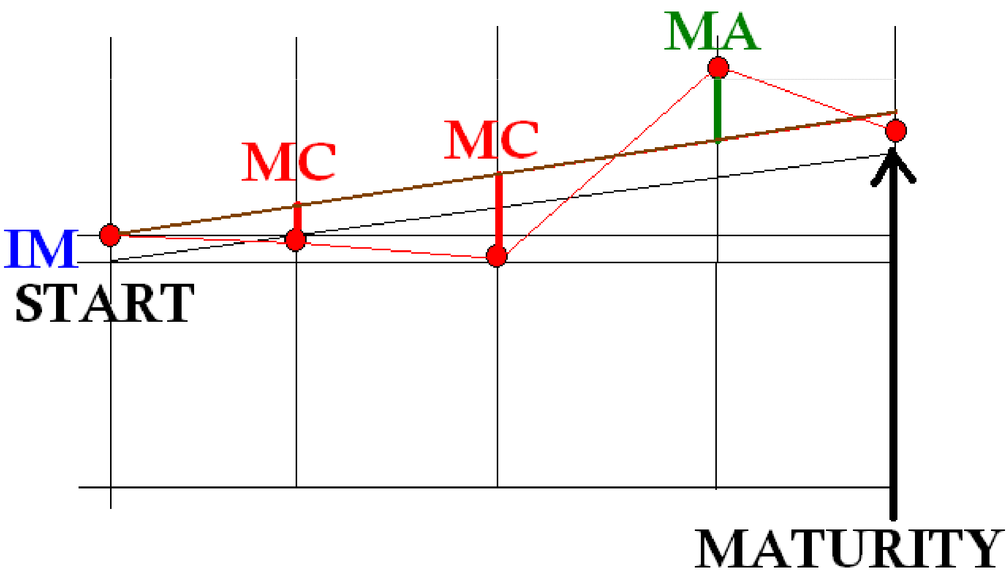
INITIAL MARGIN & MARGIN CALL

		MARGIN CALL	
market	convention	margin CALC	**MAR CALL**
115,28611%	115,28175%	-0,00436%	**ROUNDED**
114,57778%	115,49652%	0,91874%	**0,91874%**
112,86944%	115,69787%	2,82843%	**2,82843%**
117,16111%	115,91264%	-1,24847%	**-1,24847%**
115,45278%	116,11399%	0,66121%	**MATURITY**

Margin

INITIAL MARGIN & MARGIN CALL recap

	REAL MARKET CONDITIONS				CLASSIC REPO CONVENTION TRADE AMOUNT						MARGIN CALL	
					2,50%				2,50%			
	PRICE	bd days	ACCRUED	ALLIN	WITH INITIAL MARGIN		repo int accr	TOTAL	CUR MARGE	TOT	margin CALC	MAR CALL
18/12/2006	112,00%	169	3,28611%	115,28611%	**112,470%**	0	0,00000%	112,470%		115,28175%	-0,00436%	**ROUNDED**
3/01/2007	111,00%	184	3,57778%	114,57778%	**112,470%**	16	0,20953%	112,680%		115,49652%	0,91874%	**0,91874%**
18/01/2007	109,00%	199	3,86944%	112,86944%	**112,470%**	31	0,40597%	112,876%		115,69787%	2,82843%	**2,82843%**
3/02/2007	113,00%	214	4,16111%	117,16111%	**112,470%**	47	0,61550%	113,086%		115,91264%	-1,24847%	**-1,24847%**
18/02/2007	111,00%	229	4,45278%	115,45278%	**112,470%**	62	0,81194%	113,282%		116,11399%	0,66121%	**MATURITY**



Other Example

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Example 2

Value date : 18/10/2004
Interest Rate target : 2.20 %
Spot GC Clean Price : 99.2 (C=3%)
Cash Period : 182 days
Maturity of the PVS Bd : 25 sep 2008
Nominal Amount : 200.000.000 EUR

Other Example

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Cash details		*Paper details*	
Initial amount	200,000,000		
Value of the trade	18/10/2004	Paper Price	99.2
Days of the period	182	Coupon	3
Maturity	18/04/2005	Last coup. payment	25/09/2004
Interest Rate expected	2.2	Maturity	25/09/2008

	spot	**maturity**
Value	18-Oct-04	18/04/2005
Amount	200,000,000	200,000,000
Price	99.2	98.81
Principal	198,400,000	197,610,912
Days of interest	23	203
Interest	383,333	3,383,333
Total	**198,783,333** at 2.2	200,994,246

Coupon

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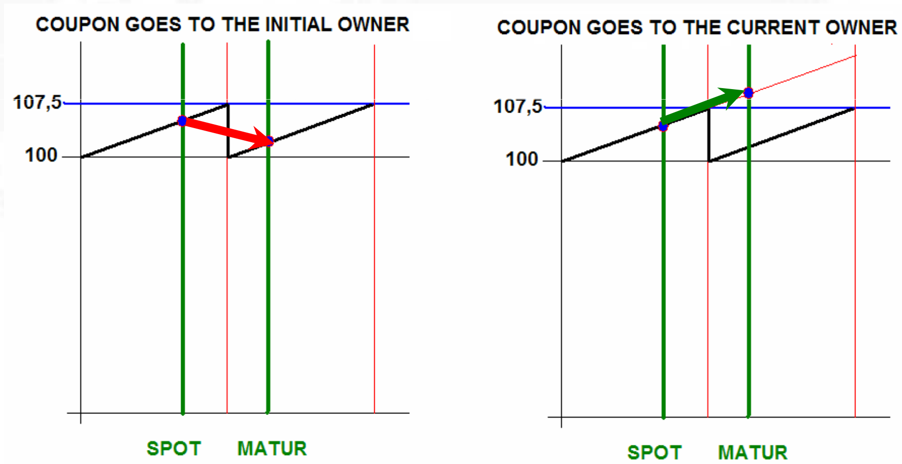
Coupon treatment if falling during the “repo” period :

Price 100 Coup 7,5%



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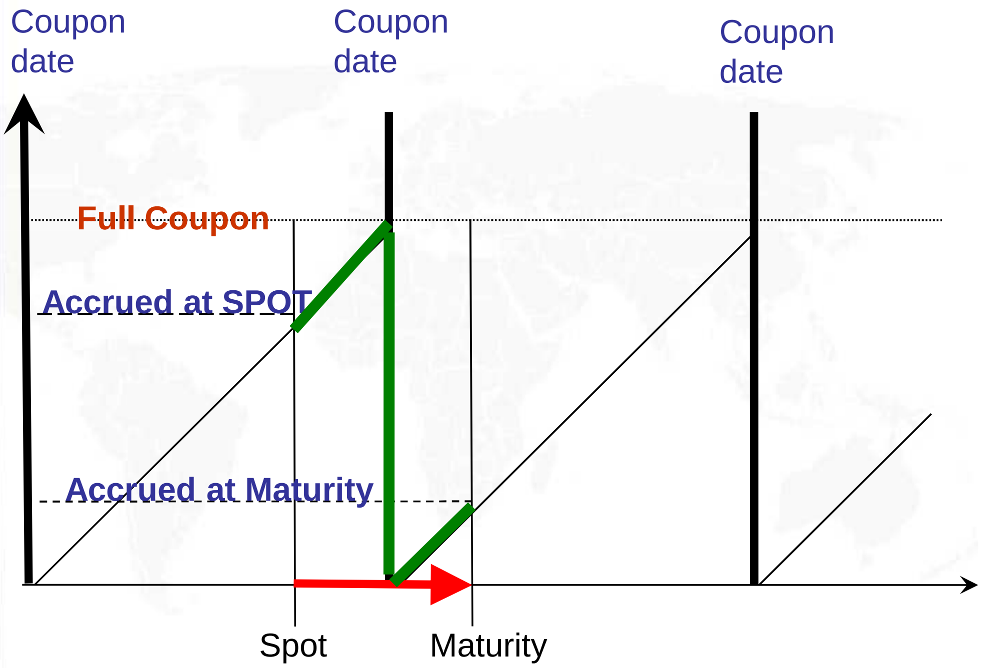
Bond Pricing

ACCRUED OF INTEREST



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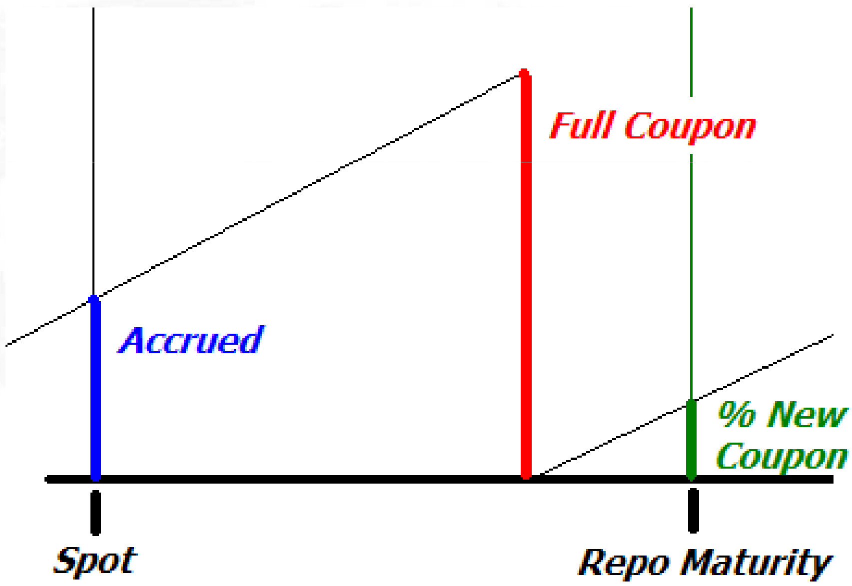

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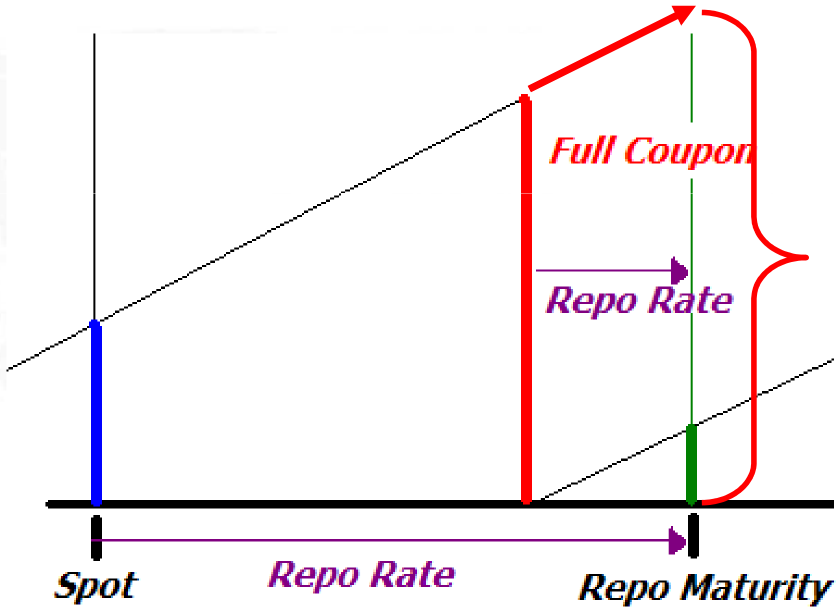

Coupon Example

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Example 3

Value date : 27/04/2008
Interest Rate target : 2.95 %
Spot GC Clean Price : 101 (C=5,5%)
Cash Period : 92 days
Coupon falling during the repo period
Nominal Amount :173.000.000 EUR

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Coupon Example in SBB

Cash details		Paper details		
		Initial amount	173 000 000,00	
Value of the trade	27/03/2008	Paper Price	101	
Days of the period	92	Coupon	5,5	
Maturity	27/06/2008	Last coup. payment	16/06/2007	
Interest Rate expected	2,95	Maturity	16/06/2011	4,02
If Classic repo, Initial Margin of :				

SELL & BUY BACK CONTRACT

	Spot			Maturity	
Value	27-mars-08			27-juin-08	
Amount	173 000 000,00			173 000 000,00	
Price	101,00			100,41384	
Principal	174 730 000,00			173 715 934,56	
			on 11 euro days	8 576,72	*int. on recapital*
			16/06/2008	9 515 000,00	*Full coupon*
Days for interest accrued	281			11	
Interest accrued	7 426 986,11			290 736,11	
Total	**182 156 986,11** at	2,95		183 530 247,39	

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Coupon Example in Classic

II 10 **-B&C**

Cash details		Paper details	
		Initial amount	173 000 000,00
Value of the trade	27/03/2008	Paper Price	101
Days of the period	7	Coupon	5,5
Maturity	03/04/2008	Last coup. payment	16/06/2007
Interest Rate expected	2,95	Maturity	16/06/2011
If Classic repo, Initial Margin of :	2,25%		

CLASSIC REPO WITH INITIAL MARGIN

	Spot	Maturity
Value	27-mars-08	03-avr-08
Amount	173 000 000,00	
Price	101,00	
Principal	174 730 000,00	
Days for interest accrued	281	
Interest accrued	7 426 986,11	
Total	**182 156 986,11**	
2,25%	178 148 600,00 at 2,95	178 250 788,02

Classic Repo

Coupon Example

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Coupon treatment in case of falling down during the repo period :

The coupon will be recapitalized at the Repo Rate during the remaining period (RP).

This method is obviously an approximation because the repo rate is definitely not the correct rate for the RP but is the sole available estimation (caeteris paribus).

The coupon is TRANSFERRED to the buyer exclusively in case of SBB, not in the Classic Repo !

Some Other Notions

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HOLD-IN-CUSTODY (HIC)

To reduce transaction costs and facilitate substitution, the cash taker retain the paper in a its segregated account …

… While the cash provider is the beneficial owner of the paper

BUT CARE ON THE **Double Dipping**

using a bond several times as a security in a repo, This practice is not permitted and is only possible, if the seller does not deliver the security to the purchaser as in the HIC repo

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Margin
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Some other notions
General Conclusion

Some Other Notions

TRI-PARTITE-REPO

A third party (bank or clearing house) is acting as an agency broker, standing in the middle

Less specific administration,

no need of account in settlement system without HIC Repo

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Cash Money Markets

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SOME LONG TERM GOVIES

	GILT *	UK
	T BOND	USA
	BUND	GER
	OLO	BEL
	OAT	FRA
	BTP	ITA
	JGBs	JPN

* : CRESTCo CGO (Central Gilt Office)
Software for Gilt Settlement

Some Other Notions

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- Dollar Repo (*diff. paper at the maturity*)
- Cheapest to deliver (*Lg Term Futures*)
- Cash and carry (*Implied Interest Rate*)
- Cross currency Repo (*Paper and Repo dif. Cur.)*
- Matched Book Trading (*Market Maker*)

General Conclusion

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As we saw, the computation formulas are not the same, and so, just to remind us which one we have to use for each instrument :

1	2	3
SIMPLE INTEREST INSTRUMENTS	**DISCOUNT INSTRUMENTS QUOTED ON A YIELD**	**PURE DISCOUNT INSTRUMENTS**
Simple interest CDs Classic Repos Deposits and Loans	French BTF Belgian T-Bills, ….. Discount Certificates of Deposits Euro Commercial Paper	UK T-Bills US T-Bills German BuBills, … UK Eligible Bills Bankers' acceptances (UK, US, ...) US domestic Commercial Papers

Capital Gain

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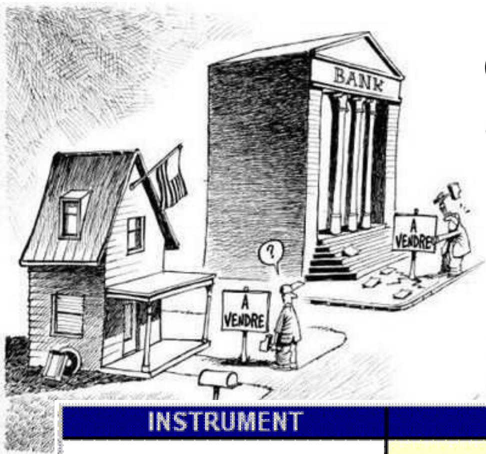
General Conclusion



INSTRUMENT	MATURITY	RISK
US T BILLS	Terms 1, 3, 6, 12 months	State
UK T BILLS	Terms 1, 3, 6, 12 months	State
CD	Common terms : 1, 3, 6 month (broken dates possible) Also terms between 1 year to 5 years	Bank
EURO CP	From 1 week to one year	Companies
US DOMESTIC CP	From 2 to 270 days	Companies
BANKER'S ACCEPTANCES	Variable (depends on the term of the Bill of Exchange)	Bank
UK ELIGIBLE BILL	Maximum 187 days	UK State

Chap. 3

Syllabus
ACI Dealing Certificates

1. Basic Interest Rate Calculations
2. Cash Money Markets
3. Foreign Exchange
4. Forward-forwards, FRAs and Money Market Futures & Swaps
5. Options
6. Principles of Risk
7. The Model Code
8. Sundries

Foreign Exchange

CHAP 3
Foreign Exchange

- Spot
- Cross
- Outright Forward
- FX Swap
- Time Forward Option
- Precious Metals

Aim:

To understand and be able to apply spot exchange rate quotations. To understand basic spot FX dealing terminology and the role of specialist types of intermediary. To recognise the principal risks in spot and forward FX transactions. To calculate and apply forward FX rates, and understand how forward rates are quoted. To understand the relationship between forward rates and interest rates. To be able to describe the mechanics of outright forwards and FX swaps, explain the use of outright forwards in taking currency risk and explain the use of FX swaps in rolling spot positions, hedging outright forwards, creating synthetic foreign currency assets and liabilities, and in covered interest arbitrage. To be able to recognise and use quotes for precious metals, and demonstrate a basic understanding of the structure and operation of the international market in precious metals.

Foreign Exchange

CHAP 3
Foreign Exchange

- Spot
- Cross
- Outright Forward
- FX Swap
- Time Forward Option
- Precious Metals

Candidates should be able to (1/2) :

- identify the base currency and the quoted currency in standard exchange rate notation
- select which currency should be the base currency in any currency pair
- recognise the ISO codes for the currencies of the countries affiliated to ACI. *(The Financial Markets Association)*
- distinguish between the “big figures” and the “points/pips”
- apply a bid/offer spot exchange rate as price-maker and price-taker to convert either a base or quoted currency amount
- select the best of several spot rates for the buyer or seller of an amount of base or quoted currency
- understand basic spot FX dealing terminology as explained in The Model Code
- calculate cross-rates from pairs of exchange rates where the common currency is the base currency in both rates, where the common currency is the base currency in only one rate and where the common currency is the base currency in neither rate
- calculate and explain the reciprocal rate of an exchange rate
- define the function of market-making and explain the incentives to make markets and the particular risks of market-making
- outline what a voice-broker does and distinguish voice-brokers from principals
- outline what an automatic trading system (ATS) or electronic broker does in spot FX
- calculate a forward FX rate from a spot FX rate and interest rates
- calculate an outright forward FX rate from a spot rate and the forward points, and vice versa

Foreign Exchange

Candidates should be able to (2/2) :

- explain the relationship between the outright forward rate, the forward points, the spot rate and interest rates, including the concept of interest rate parity, and the possibility and concept of covered interest arbitrage
- fix forward value dates for standard periods and list those periods
- describe the structure and mechanics of an FX outright, and outline how an outright forward can be hedged with a spot transaction and deposits
- describe the structure and mechanics of an FX swap, and outline how it can be used in place of deposits to hedge an FX outright and the advantages
- use generally-accepted terminology to specify an FX swap
- outline the applications of FX swaps in creating synthetic foreign currency asset and liabilities, and in covered interest arbitrage
- outline the application of tom/next and overnight FX swaps in rolling over spot positions and hedging value-tomorrow and value- today outright rates, and calculate a value-tomorrow rate from a spot rate and tom/next points, and a value-today rate from a spot rate, tom/next points and overnight points
- calculate broken-dated forward FX rates through linear interpolation
- calculate forward cross-rates
- list the commodities called precious metals (gold, silver, platinum and palladium) and give their ISO codes
- describe the conventional method of quoting gold in the international market in US dollars per ounce
- apply a bid/offer spot price as price-maker and price-taker to calculate the value of a given weight of precious metals
- distinguish between precious metals trading for physical delivery and book entry
- distinguish between the spot, forward and derivative markets in precious metals
- outline the mechanics and role of the London gold price fixing
- explain the role of gold lending/borrowing and define the gold offered forward rate or lease rate

Foreign Exchange

Chapter 3. Foreign Exchange

Part I

Spot
Cross Outright

Part II

FX Swap
Time (Delivery) Forward Option
Precious Metals

Foreign Exchange

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ATF LUXEMBOURG

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Definition

Spot Forex is the ratio "quote" between the USD and another currency.

Direct quoted currency : **USD** / Curr

so when the USD is the Base

Indirect quoted currency : Curr / **USD**

so when the USD is ***not*** *the Base*

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Base / Sub Ratio

Quote Example :

If the equivalent of 1 Base is 5,1234 sub, the value of the

$$\text{Spot } \textbf{BASE}/\text{sub} = \frac{5{,}1234}{1} = 5{,}1234$$

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Base / Sub Ratio

Direct Quote Example :

If the equivalent of 1.000.000 USD is 1.655.000 CHF, the value of the

$$\text{Spot } \textbf{USD}/\text{CHF} = \frac{1.655.000}{1.000.000} = 1{,}6550$$

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Base / Sub Ratio

Indirect Quote Example :

If the equivalent of 1.000.000 USD is 850.000 EUR, the value of the

$$\text{Spot } \mathbf{EUR}/\text{USD} = \frac{1.000.000}{850.000} = 1{,}1765$$

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Dates

The SPOT date term is used in many markets and is 2 **working** days forward from the deal date …

… taking into account the WE and the holidays in the country of the currencies involved in the trade.

(like the way we presented in cash dates presentation)

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Dates

Care on some particularities :

1. Different holidays on different financial centers inside the same country

(Lugano and Zurich for example)

2. Islamic WE falls on Thursday afternoon and Friday (so some local currencies can be settled on Saturday or Sunday)

(In Gulf states for example)

LUXEMBOURG

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Dates

The **TARGET**

Trans European
Automated
Real-Time
Gross Settlement
Express
Transfer System

For EUR, open on all weekdays in the year, except for 1st of January, Good Friday, Easter Monday,1st of May, Christmas Day and 26 December and specific days announced by the ECB

Dates

The Ante-Spot dates

On specific cases, traders can deal prior spot date
on outright value today or
on outright value tomorrow

Rate calculation will be detailed later on

Quotations

SPOT QUOTATION :

SPREAD

EUR/USD : 1, 21 10 – 15

BIG FIGURE

BID POINTS
OR PIPS

OFFER POINTS
OR PIPS

Quotations

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SPOT QUOTATION :

EUR/USD : 1,21 10 – 15

BID POINTS OFFER POINTS

where 1 pip is 1/10.000 th of the currency unit
quotations on 4 decimal places except CZK (3 dec places)
and sometimes on 1/100 th like for JPY (big points)

Quotations

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SPOT QUOTATION :

EUR/USD : 1,21 10 – 15

At this price, the Market Maker (Quoter)
is buying the **EUR** & is selling the **USD**

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SPOT QUOTATION :

EUR/USD : 1,21 10 – 15

At this price, the Market **User**
is buying the **USD** & is selling the **EUR**

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SPOT QUOTATION :

EUR/USD : 1,21 10 – 15

At this price, the Market Maker (Quoter)
is selling the **EUR** & is buying the **USD**

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SPOT QUOTATION :

EUR/USD : 1,21 10 – 15

At this price, the Market **User** is selling the **USD** & is buying the **EUR**

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Quotations

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SPOT QUOTATION :

Main/Sub : 1,21 $\boxed{10}$ – $\boxed{15}$

MM buys Main	MM sells Main
MM sells Sub	MM buys Sub
MU buys Sub	MU sells Sub
MU sells Main	MU buys Main

Quotations

MKT	MK	EUR / USD		TIME
ABC	BK	1,2129 /	39	10.30
DEF	BK	1,2131 /	41	10.31
GHI	BK	1,2133 /	43	10.31
JKL	BK	1,2135 /	45	10.31
MNO	BK	1,2137 /	47	10.30
PQR	BK	1,2128 /	38	10.31

If this quotations are dealing prices from different Market Makers and applicable to my bank, we can

1- Detect the real close price I can hit
2- The best price if I want to buy the EUR
3- The best price if I want to buy the USD

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Quotations

MKT	MK	EUR / USD		TIME
ABC	BK	1,2129 /	39	10.30
DEF	BK	1,2131 /	41	10.31
GHI	BK	1,2133 /	43	10.31
JKL	BK	1,2135 /	45	10.31
MNO	BK	1,2137 /	47	10.30
PQR	BK	1,2128 /	38	10.31

If this quotations are dealing prices from different Market Makers and applicable to my bank, we can

1- Detect the real close price I can hit
2- The best price if I want to buy the EUR
3- The best price if I want to buy the USD

Quotations

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MKT	MK	EUR / USD		TIME
ABC	BK	1,2129 /	39	10.30
DEF	BK	1,2131 /	41	10.31
GHI	BK	1,2133 /	43	10.31
JKL	BK	1,2135 /	45	10.31
MNO	BK	1,2137 /	47	10.30
PQR	BK	1,2128 /	38	10.31

(1) Mixing the quotations from MNO BK and PQR BK, I can use the best dealing price like being :

1,2137 – 38

Quotations

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MKT	MK	EUR / USD		TIME
ABC	BK	1,2129 /	39	10.30
DEF	BK	1,2131 /	41	10.31
GHI	BK	1,2133 /	43	10.31
JKL	BK	1,2135 /	45	10.31
MNO	BK	1,2137 /	47	10.30
PQR	BK	1,2128 /	38	10.31

(2) The best price if I Want to buy the EUR is the price quoted by PQR BK

So I take the EUR at **1,2138**

(cheapest offer side)

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MKT	MK	EUR / USD		TIME
ABC	BK	1,2129 /	39	10.30
DEF	BK	1,2131 /	41	10.31
GHI	BK	1,2133 /	43	10.31
JKL	BK	1,2135 /	45	10.31
MNO	BK	1,2137 /	47	10.30
PQR	BK	1,2128 /	38	10.31

(3) The best price if I Want to buy the USD is the price quoted by MNO BK

So I take the USD at **1,2137**

(higher bid side of the Base

so the cheapest offer side of the sub)

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Reciprocal Rate

The Reciprocal Rate is the Rate quotation when the sub currency is transformed into a Base currency

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Quotations

Reciprocal Rate Example

IF EUR/GBP : 0,6353 – 0,6363

Then the reciprocal rate is

$\frac{1}{0,6363}$ and $\frac{1}{0,6353}$

GBP/EUR : 1,5716 – 1,5741

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Quotations

MKT	MK	GBP / EUR		TIME
ABC	BK	1,6140 /	50	11.30
DEF	BK	1,6144 /	54	11.31
MKT	**MK**	**EUR / GBP**		**TIME**
GHI	BK	0,6193 /	99	11.30
JKL	BK	0,6190 /	96	11.31

If this quotations are dealing prices from different Market Makers and applicable to my bank, we can

1- Detect the real close price I can hit
2- The best price if I want to buy the EUR
3- The best price if I want to buy the GBP

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Quotations

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GBP / EUR
1,6140 / 50
1,6144 / 54

Reciprocal rate

MKT	MK	EUR / GBP	TIME
ABC	BK	0,6192 / 96	11.30
DEF	BK	0,6190 / 94	11.31
GHI	BK	0,6193 / 99	11.30
JKL	BK	0,6190 / 96	11.31

First of all, we will make quotations comparable by calculating the reciprocal rate for EUR/GBP from the GBP/EUR

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Quotations

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MKT	MK	EUR / GBP	TIME
ABC	BK	0,6192 / 96	11.30
DEF	BK	0,6190 / 94	11.31
GHI	BK	0,6193 / 99	11.30
JKL	BK	0,6190 / 96	11.31

Now we can easily answer the question :

1- The real close price is 0,6193 – 0,6194

2- The best price if I want to buy the EUR is 0,6194

3- The best price if I want to buy the GBP is 0,6193

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Pips Meaning

1 pip is 1/10.000th of the sub UNIT

Ex : On USD/CAD 1.1340 I buy 1.000.000 USD.

So I'm long of 1.000.000 USD
And I'm short of 1.134.000 CAD

The next price is 1.1341 so I sell my 1.000.000 USD

So I'm squared in USD
And I have a profit of 1.134.100 - 1.134.000 CAD
= **100 CAD**

So that 1 pip move means that I made 1/10.000th of the sub UNIT (CAD)

1/10.000th on 1.000.000 CAD which is **100 CAD**

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Position

III 1

USD / CAD	TIME
1,2129 / 32	7.50
1,2131 / 34	8.14
1,2133 / 36	10.31
1,2137 / 40	11.45
1,2141 / 44	15.22
1,2138 / 41	16.59

DEAL		MOVEMENT		POSITION		AVERAGE
ORDER	PRICE	USD	CAD	USD	CAD	PRICE
MINE	1,2132	+ 10.000.000	- 12.132.000	+ 10.000.000	- 12.132.000	1,2132
MINE	1,2134	+ 20.000.000	- 24.268.000	+ 30.000.000	- 36.400.000	1,2133
MINE	1,2136	+ 50.000.000	- 60.680.000	+ 80.000.000	- 97.080.000	1,2135
YOURS	1,2137	- 30.000.000	+ 36.411.000	+ 50.000.000	- 60.669.000	1,2134
YOURS	1,2141	- 20.000.000	+ 24.282.000	+ 30.000.000	- 36.387.000	1,2129
YOURS	1,2138	- 30.000.000	+ 36.414.000	+ 0	+ 27.000	SQUARED

CROSS

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If a SPOT quotation is referring to the USD *(direct or indirect quoted currencies)*

USD/CUR1

The **CROSS** is the quotation between two currencies excluding the USD.

CUR1 / CUR 2

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Definition

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This quotation can be directly available in the market

CUR1 / CUR 2

Or can be the result of the combination of the two spot involved like

USD/CUR1 and USD/CUR2

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Definition

But which CUR will be the Base and consequently the other the Sub ?

CUR1 / CUR 2

Or

CUR 2 / CUR1

CHAP 3
Foreign Exchange

PART I

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Definition

Both can be asked on request but Market “usance” always proposes a certain order :

If the **EUR** is involved in the quotation, EUR will be automatically considered as the BASE CURRENCY
(even against USD & GBP)

For the other situation, the most “important” (the most traded) currency will be placed as the Base.

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Definition

For the other situation, the most “important” (the most traded) currency will be placed as the Base :

ex.	**CHF** & DKK	→	CHF / DKK
	TRY & **JPY**		JPY / TRY
	NOK & **CAD**		CAD / NOK
	GBP & MKD		GBP / MKD
	HUF & **JPY**		JPY / HUF

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Calculation Methods

For the CROSS Calculation, we can face 3 different situations :

1- An indirect quote	with	a direct quote
2- A direct quote	with	another direct quote
3- An indirect quote	with	another indirect quote

Calculation Methods

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For the CROSS Calculation, we can face 3 different situations :

1- CUR1/USD with USD/CUR2

2- USD/CUR1 with USD/CUR2

3- CUR1/USD with CUR2/USD

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Calculation Methods

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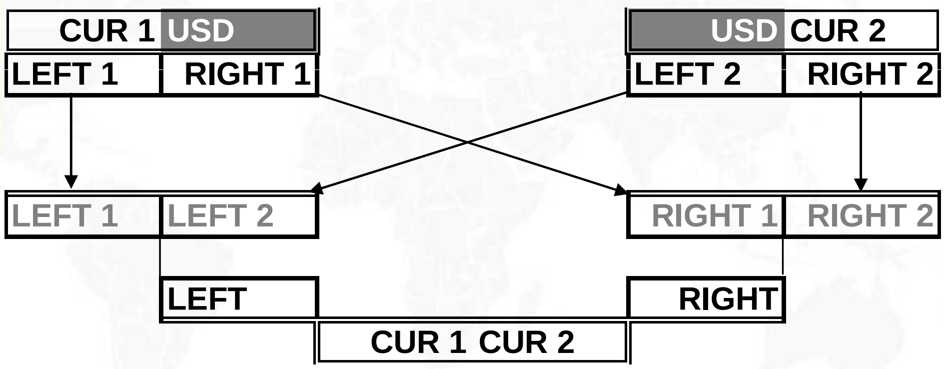
Rule for situation (1) CUR1/USD with USD/CUR2



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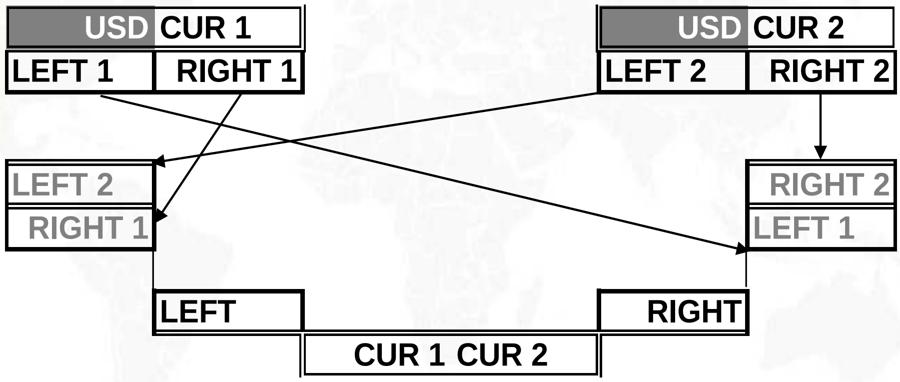
Calculation Methods

Rule for situation (2) USD/CUR1 with USD/CUR2



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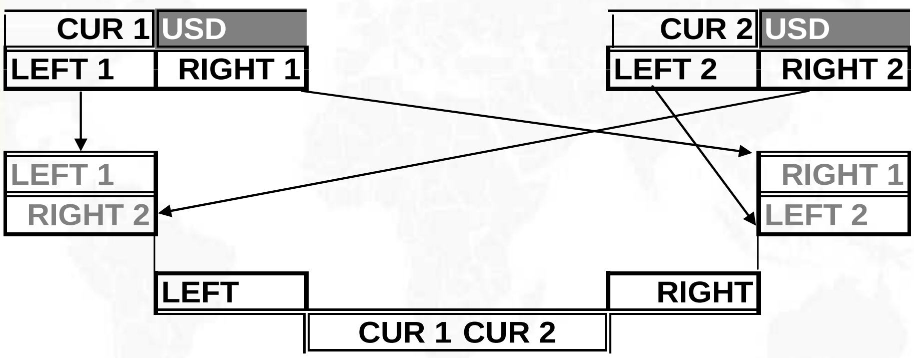
Rule for situation (3) CUR1/USD with CUR2/USD



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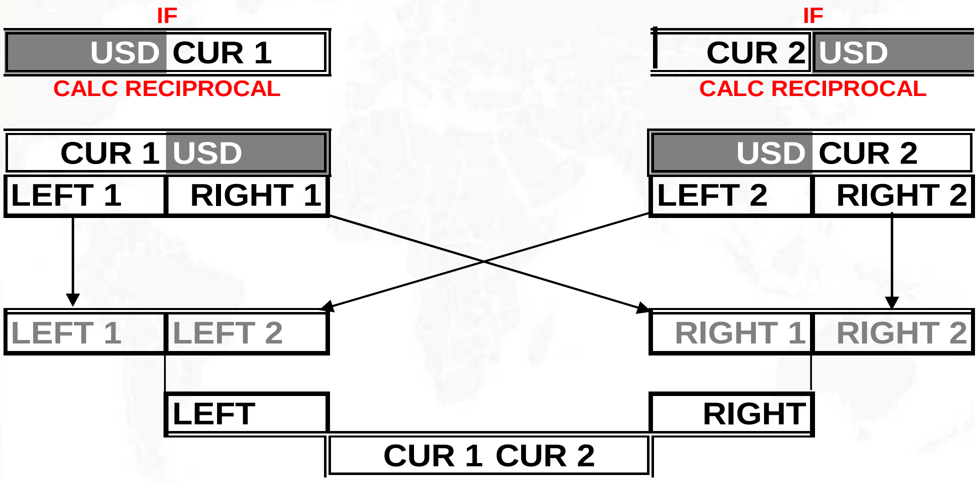
To avoid any mistake, we suggest this global method :

Reduce to 1st case



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GBP USD	1,4985	1,4990	GBP USD	*SPOT*	the quoter sells the USD 1,4985	the quoter sells the GBP 1,4990
USD CHF	1,6605	1,6615	USD CHF	*SPOT*	the quoter buys the USD 1,6605	the quoter buys the CHF 1,6615
YES	CUR 1 USD	&	USD CUR 2	COND 1	2,488259 *LEFT 1 MULT LEFT 2*	2,490589 *RIGHT 1 MULT RIGHT 2*
	USD CUR 1	&	USD CUR 2	COND 2	1,107738 *LEFT 2 DIV RIGHT 1*	1,108775 *RIGHT 2 DIV LEFT 1*
	CUR 1 USD	&	CUR 2 USD	COND 3	0,901896 *LEFT 1 DIV RIGHT 2*	0,90274 *RIGHT 1 DIV LEFT 2*

		GBP CHF		
spot	*sells the CHF buys the GBP*	2,4883	2,4906	*buys the CHF sells the GBP*

REVERSE QUOTES

		CHF	GBP	
spot	*buys the CHF sells the GBP*	0,4015	0,4019	*sells the CHF buys the GBP*

Big display on the next slide for more comfortable reading.

Calculation Methods

						the quoter sells the USD	the quoter sells the GBP
GBP USD	1,4985	1,4990		GBP	USD	SPOT 1,4985	1,4990

						the quoter buys the USD	the quoter buys the CHF
USD CHF	1,6605	1,6615		USD	CHF	SPOT 1,6605	1,6615

YES	CUR 1	USD	&	USD	CUR 2	COND 1	2,488259 LEFT 1 MULT LEFT 2	2,490589 RIGHT 1 MULT RIGHT 2
	USD	CUR 1	&	USD	CUR 2	COND 2	1,107738 LEFT 2 DIV RIGHT 1	1,108775 RIGHT 2 DIV LEFT 1
	CUR 1	USD	&	CUR 2	USD	COND 3	0,901896 LEFT 1 DIV RIGHT 2	0,90274 RIGHT 1 DIV LEFT 2

		GBP CHF		
spot	*sells the CHF* *buys the GBP*	2,4883	2,4906	*buys the CHF* *sells the GBP*

REVERSE QUOTES

		CHF	GBP	
spot	*buys the CHF* *sells the GBP*	0,4015	0,4019	*sells the CHF* *buys the GBP*

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						the quoter sells the USD	the quoter sells the NOK
USD NOK	7,8350	7,8360		NOK	USD	SPOT 0,1276	0,1276

						the quoter buys the USD	the quoter buys the CHF
USD CHF	1,6605	1,6615		USD	CHF	SPOT 1,6605	1,6615

	CUR 1	USD	&	USD	CUR 2	COND 1	13,01002 LEFT 1 MULT LEFT 2	13,01951 RIGHT 1 MULT RIGHT 2
YES	USD	CUR 1	&	USD	CUR 2	COND 2	0,211907 LEFT 2 DIV RIGHT 1	0,212061 RIGHT 2 DIV LEFT 1
	CUR 1	USD	&	CUR 2	USD	COND 3	4,715618 LEFT 1 DIV RIGHT 2	4,719061 RIGHT 1 DIV LEFT 2

		NOK CHF		
spot	*sells the CHF* *buys the NOK*	0,2119	0,2121	*buys the CHF* *sells the NOK*

REVERSE QUOTES

		CHF	NOK	
spot	*buys the CHF* *sells the NOK*	4,7156	4,7191	*sells the CHF* *buys the NOK*

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III 2-3

					the quoter sells the USD	the quoter sells the GBP
GBP USD	1,4985	1,4990	GBP USD	SPOT	1,4985	1,4990

					the quoter buys the USD	the quoter buys the AUD
AUD USD	0,5350	0,5360	USD AUD	SPOT	1,8657	1,8692

	CUR 1 USD	&	USD CUR 2	COND 1	0,801698 LEFT 1 MULT LEFT 2	0,803464 RIGHT 1 MULT RIGHT 2
	USD CUR 1	&	USD CUR 2	COND 2	0,356905 LEFT 2 DIV RIGHT 1	0,357691 RIGHT 2 DIV LEFT 1
YES	CUR 1 USD	&	CUR 2 USD	COND 3	2,795709 LEFT 1 DIV RIGHT 2	2,801869 RIGHT 1 DIV LEFT 2

		GBP AUD		
spot	sells the AUD buys the GBP	2,7957	2,8019	buys the AUD sells the GBP

REVERSE QUOTES

		AUD	GBP	
spot	buys the AUD sells the GBP	0,3569	0,3577	sells the AUD buys the GBP

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Voice broker

Electronic broker

Reuter Dealing

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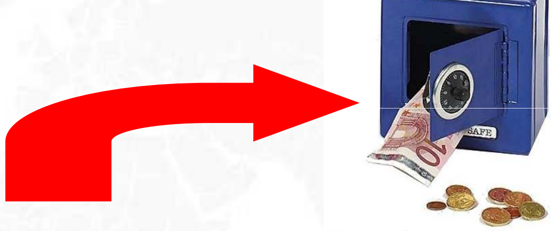
Direct (Interbank)



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Voice broker

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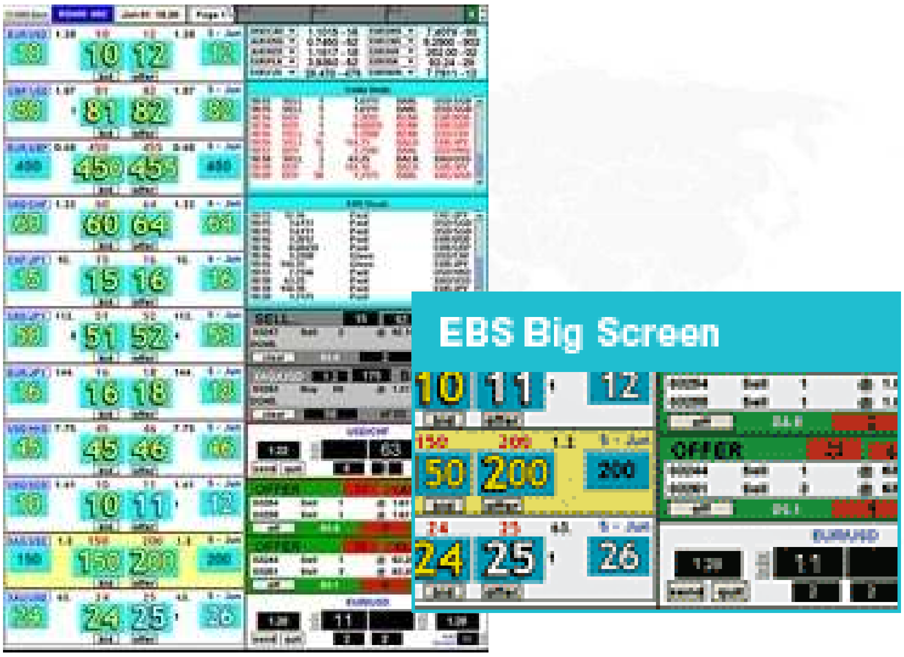
Electronic broker



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Reuter Dealing

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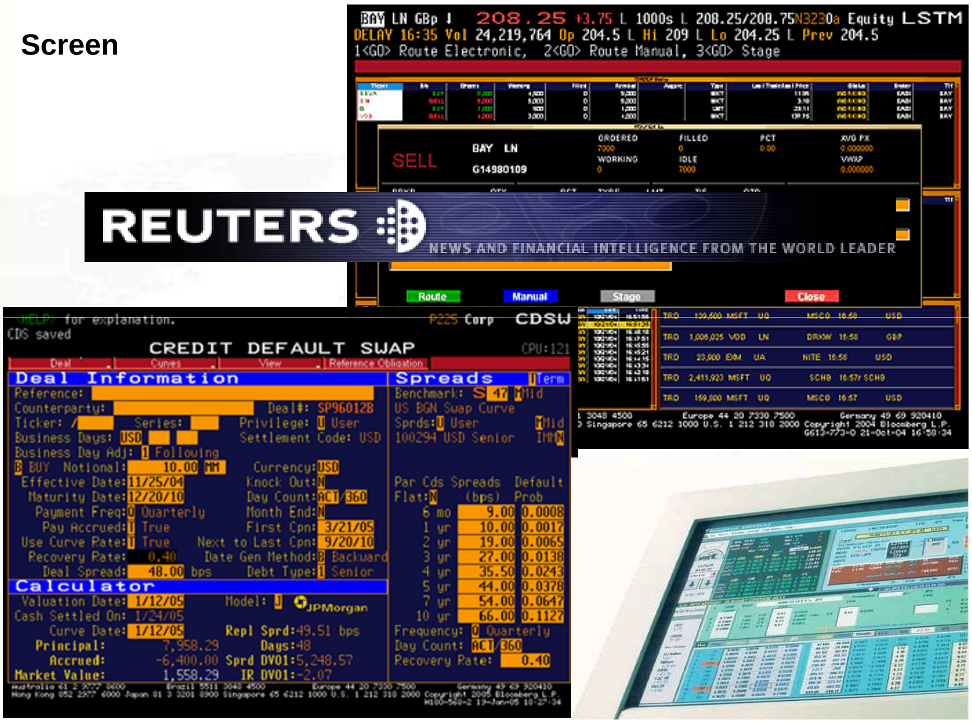

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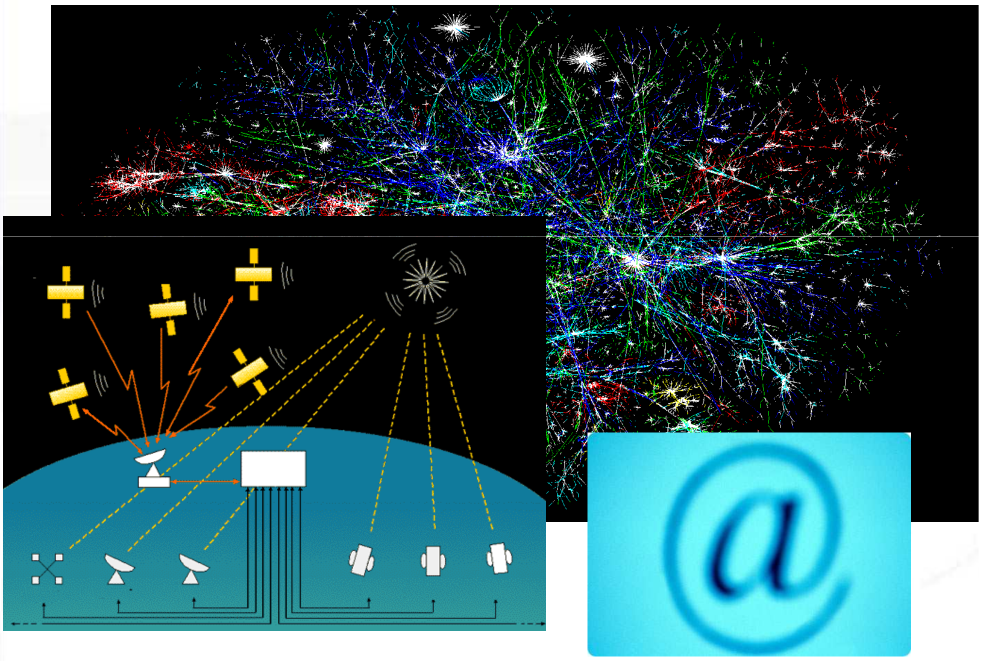
Internet



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Market "slang" and "usance"

OK, Done, Agreed, Mine, Yours, …
Change, off, reference, Choice, …
Can't touch, my risk, for info, level, …
Long, short, squared, stuffed, …

Refer to the "Slang Show Presentation"

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Outright Forward

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The spot quotation will provide us the prices for very short term perspectives (2 working days).

Outright forwards will provide us quotations in the medium term (and even long term if necessary).

How can we calculate de forward relationship between 2 currencies ?

The interest rates will explain that evolution :

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Calculation

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Evolution of two currencies in the future

Now (on spot) 1 EUR = **1,5750** CHF

1 EUR invested at 6mths EUR IR will be =
1 * (1+(**2,5** *186/(360*100)) = 1,01291667

1,5750 CHF invested at 6mths CHF IR will be =
1. 5750 * (1+(**1,3** *186/(360*100)) = 1,58557875

Thus the new ratio (in 186 days) will be =
1,58557875 / 1,01291667 = **1,56536**

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Calculation

Inflation driving the IR, we have the basis for the

POWER PARITY THEORY

Now (on spot) 1 EUR = **1,5750** CHF

If inflation is higher in the Eurozone (than in the Switzerland)
The consequence will be that the value of the EUR will be lower in the future against the CHF

1 EUR invested at 6mths EUR IR will be =
1 * (1+(**2,5** *186/(360*100)) = 1,01291667

1,5750 CHF invested at 6mths CHF IR will be =
1. 5750 * (1+(**1,3** *186/(360*100)) = 1,58557875

Thus the new ratio (in 186 days) will be =
1,58557875 / 1,01291667 = **1,56536**

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Calculation

The Forward is expressed in terms of PIPS

In our example :

OUTRIGHT	=	1,56536
- SPOT	=	- 1,57500
FORWARD	=	- 0,00964

so Forward Points = **- 96,4 pips**

Calculation

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The FWD FOREX Rates are available in the market as the cash prices :

currencies and periods

For major currencies from O/N to 1 Year like :

Calculation

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EUR/USD FWD Pts & OUTRIGHT

Ex.

Spot

1,2206

+ (-9,5) pts

Forward

1,21965

	Days	1,2208	SWAP	1,2206	1,2210
O/N	3	-0,49	-0,48	1,220551	1,220952
T/N	1	-0,15	-0,14	1,220585	1,220986
S/N	1	-0,1	-0,09	1,220590	1,220991
1 W	7	-0,69	-0,65	1,220531	1,220935
2 W	14	-1,38	-1,3	1,220462	1,220870
3 W	21	-2,07	-2	1,220393	1,220800
1	30	-2,93	-2,88	1,220307	1,220712
2	62	-5,5	-5,4	1,220050	1,220460
3	91	-6,7	-6,55	1,219930	1,220345
4	122	-8,13	-7,66	1,219787	1,220234
5	154	-9,05	-8,57	1,219695	1,220143
6	182	-9,5	-9	1,219650	1,220100
7	212	-10,5	-9,75	1,219550	1,220025
8	244	-11,2	-10,2	1,219480	1,219980
9	273	-11,75	-11	1,219425	1,219900
10	303	-12,28	-11,2	1,219372	1,219880
11	335	-12,67	-11,5	1,219333	1,219850
12	365	-13	-12	1,219300	1,219800

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Calculation

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The method to research

- the value dates and
- the maturities

is exactly similar to the cash method but be careful that you have to take the 2 currencies common holidays into account

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Premium/Discount

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PREMIUM

If the currency being referred to is more expensive to buy on the forward date than it is on spot

DISCOUNT

If the currency being referred to is cheaper to buy on the forward date than it is on spot

Premium/Discount

PREMIUM IN BASE (USD) … ***or DKK discount***

If IR USD **<** IR DKK

=> FWD PTS ARE **POSITIVE**
=> USD/DKK later **>** USD/DKK now

DISCOUNT IN BASE (EUR) … ***or USD premium***

If IR EUR **>** IR USD

=> FWD PTS ARE **NEGATIVE**
=> EUR/USD later **<** EUR/USD now

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Premium/Discount

Example :

1	0,6803	0,6803
182	182	
2,17	4,97	
2,2	5,02	
1,01097056	0,69732875	0,689761679
1,01112222	0,69715914	0,689490472
		0,009461679
		0,009190472
	91,90	94,62

Spot EUR/GBP is 0,6803
6 months EUR : 2,17 – 2,20 % ***(182 days)***
6 months GBP : 4,97 – 5,02 % ***(182 days)***

=> Calc 6 mth FWD Pts : 91,90 – 94,62

FWD EUR **PREMIUM**
and FWD GBP **DISCOUNT**

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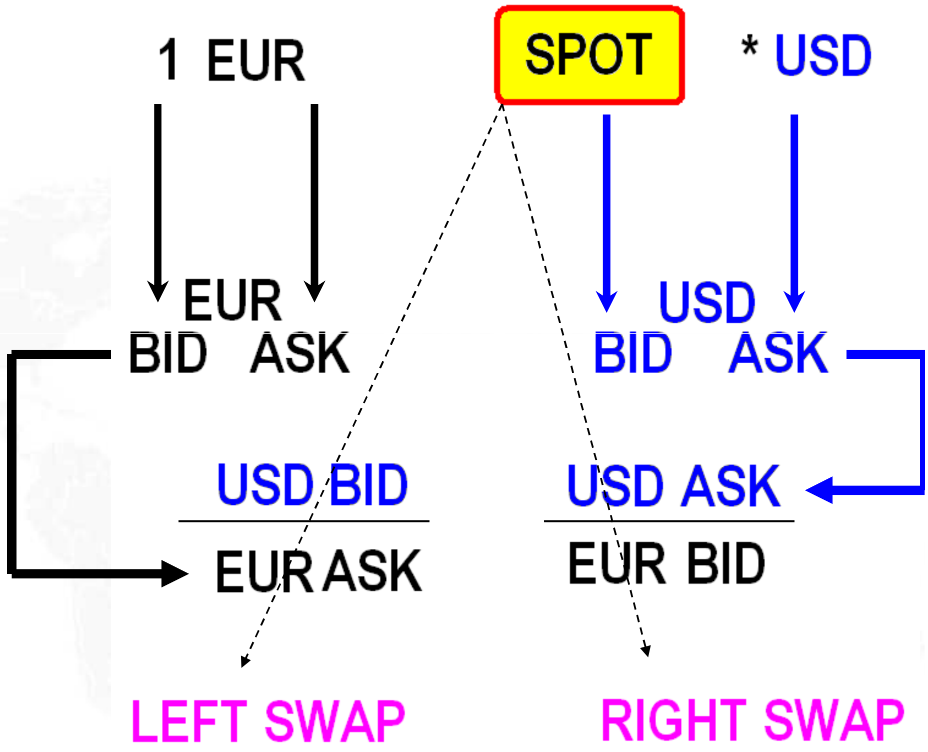
Premium/Discount



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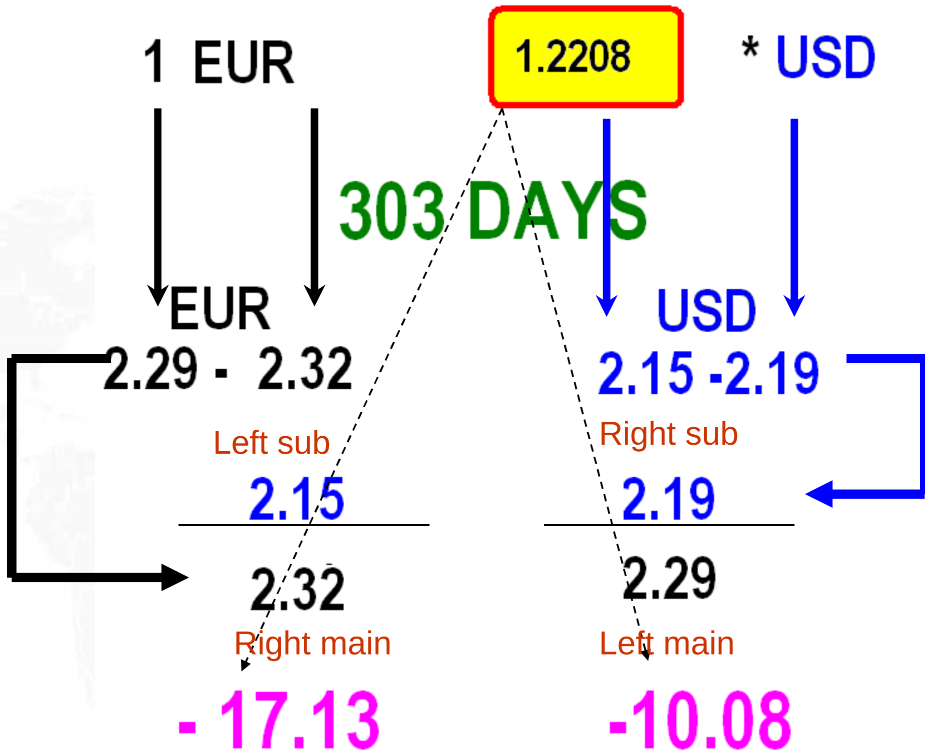
Premium/Discount



Display meaning

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How to translate the usual display ?

	Days	5,2468	
O/N	3	0,8	0,6
T/N	1	0,2	0
S/N	1	##0,1	0,1##
1 W	7	0	2
1	30	2	1
2	62	##1	1##
3	91	PAR	5
6	182	2	7
9	273	4	9
12	365	5	11

	Days	5,2468	
O/N	3	- 0,8	- 0,6
T/N	1	- 0,2	0
S/N	1	- 0,1	+ 0,1
1 W	7	0	+ 2
1	30	- 2	- 1
2	62	- 1	+ 1
3	91	0	+ 5
6	182	+ 2	+ 7
9	273	+ 4	+ 9
12	365	+ 5	+ 11

Display meaning

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The Forward points

for USD/JPY are

BIG POINTS

USD/JPY	Days	115,55		115,5	115,6
1	30	-50	-45	115,000000	115,150000
2	62	-100	-95	114,500000	114,650000
3	91	-150	-145	114,000000	114,150000
6	182	-300	-295	112,500000	112,650000
12	365	-595	-590	109,550000	109,700000

Cross Fwd Calculation

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For the CROSS FWD Calculation, we can face 3 different situations :

1- An indirect quote	with	a direct quote
2- A direct quote	with	another direct quote
3- An indirect quote	with	another indirect quote

Cross Fwd Calculation

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For the CROSS FWD Calculation, we can face 3 different situations :

1-	CUR1/USD	with	USD/CUR2
2-	USD/CUR1	with	USD/CUR2
3-	CUR1/USD	with	CUR2/USD

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Cross Fwd Calculation

We proceed with the Outright price exactly as we did for the cross calculation on spot date

After, we can deduct the Spot price from the Outright and we have the swap points

(* 10.000 or * 100 if big points as for JPY)

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Cross Fwd Calculation

						the quoter sells the USD	the quoter sells the GBP
GBP USD	1,6000	1,6010	GBP	USD	SPOT	1,6000	1,6010
	-5	-2					
	1,5995	1,6008			FORW	1,5995	1,6008

						the quoter buys the USD	the quoter buys the JPY
USD JPY	115,9000	116,0000	USD	JPY	SPOT	115,9000	116,0000
	-15000	-14500					
	114,4000	114,5500			FORW	114,4000	114,5500

YES	CUR 1 USD	&	USD CUR 2	COND 1	185,44 *LEFT 1 MULT LEFT 2*	185,716 *RIGHT 1 MULT RIGHT 2*
	USD CUR 1	&	USD CUR 2	COND 2	7239,225 *LEFT 2 DIV RIGHT 1*	7250 *RIGHT 2 DIV LEFT 1*
	CUR 1 USD	&	CUR 2 USD	COND 3	0,013793 *LEFT 1 DIV RIGHT 2*	0,013814 *RIGHT 1 DIV LEFT 2*

COND 1

		GBP JPY		
spot	*sells the JPY buys the GBP*	185,4400	185,7160	*buys the JPY sells the GBP*
fwd	*sells the JPY buys the GBP*	182,9828	183,3716	*buys the JPY sells the GBP*
		-245,72	**-234,44**	
		buys and sells the sub	*sells and buys the sub*	

REVERSE QUOTES

		JPY	GBP	
spot	*buys the JPY sells the GBP*	0,0054	0,0054	*sells the JPY buys the GBP*
fwd	*buys the JPY sells the GBP*	0,0055	0,0055	*sells the JPY buys the GBP*
		0,61	**0,80**	
		buys and sells the sub	*sells and buys the sub*	

USD JPY FOR 100 USD

Cross Fwd Calculation

GBP USD	1,6000	1,6010	GBP USD			the quoter sells the USD	the quoter sells the GBP
	-5	-2			SPOT	1,6000	1,6010
	1,5995	1,6008			FORW	1,5995	1,6008

USD JPY	115,9000	116,0000	USD JPY			the quoter buys the USD	the quoter buys the JPY
	-15000	-14500			SPOT	115,9000	116,0000
	114,4000	114,5500			FORW	114,4000	114,5500

COND 1

		GBP JPY		
spot	*sells the JPY* *buys the GBP*	185,4400	185,7160	*buys the JPY* *sells the GBP*
fwd	*sells the JPY* *buys the GBP*	182,9828	183,3716	*buys the JPY* *sells the GBP*
		-245,72	**-234,44**	
		buys and sells the sub	*sells and buys the sub*	

		JPY	GBP	
spot	*buys the JPY* *sells the GBP*	0,0054	0,0054	*sells the JPY* *buys the GBP*
fwd	*buys the JPY* *sells the GBP*	0,0055	0,0055	*sells the JPY* *buys the GBP*
		0,61	**0,80**	
		buys and sells the sub	*sells and buys the sub*	

YES	CUR 1 USD	&	USD CUR 2	COND 1	185,44 *LEFT 1 MULT LEFT 2*	185,716 *RIGHT 1 MULT RIGHT 2*
	USD CUR 1	&	USD CUR 2	COND 2	7239,225 *LEFT 2 DIV RIGHT 1*	7250 *RIGHT 2 DIV LEFT 1*
	CUR 1 USD	&	CUR 2 USD	COND 3	0,013793 *LEFT 1 DIV RIGHT 2*	0,013814 *RIGHT 1 DIV LEFT 2*

USD JPY FOR 100 USD

Foreign Exchange

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If the forward points were calculated as the difference between the value of the outright and the spot price (Bid-Bid, Offer-Offer)

⇨ the **SWAP** will express the points difference between two rates used to combine the following operation :

I sell a CUR1 against a CUR2 on the spot and I **reverse** de trade in the future by buying back the CUR1 against the CUR2 at a determinate price.

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FX Swap

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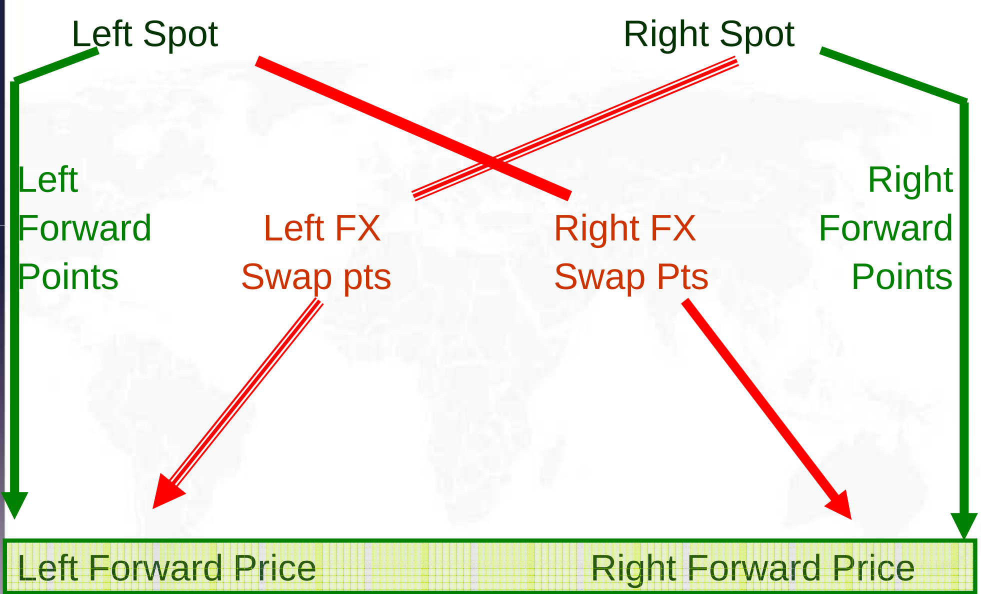
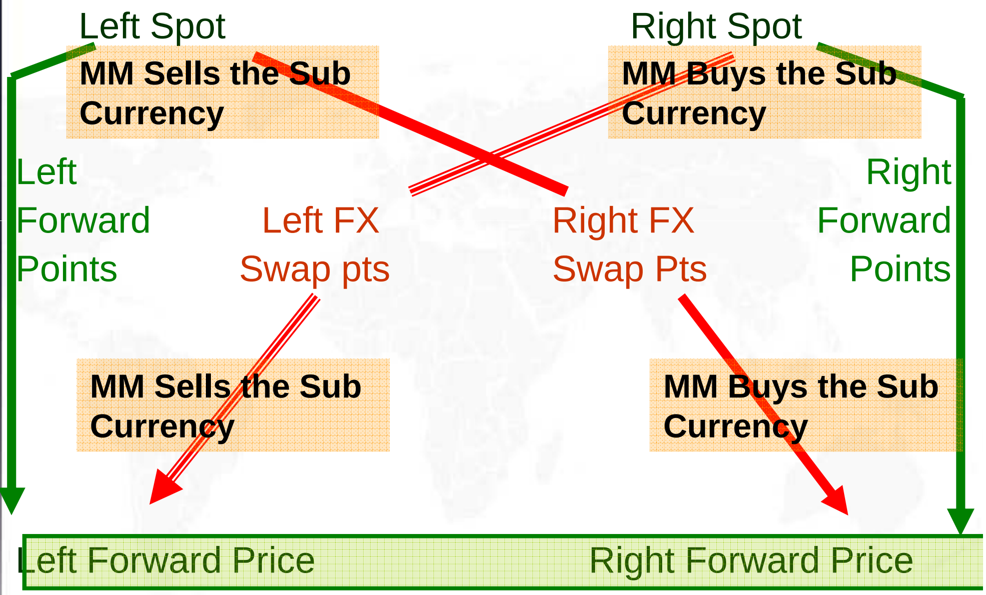


FX Swap



FX Swap

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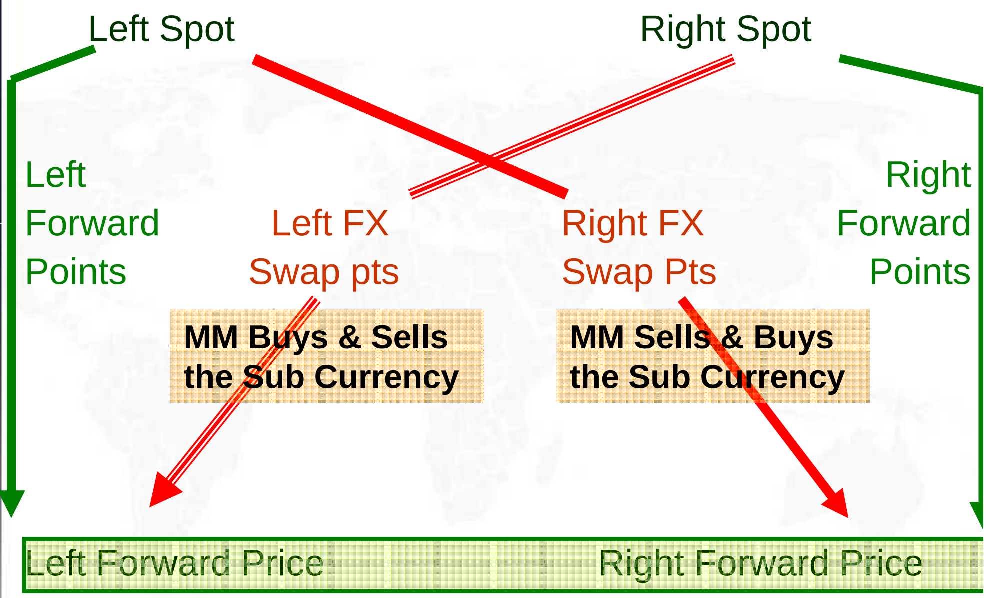

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FX Swap

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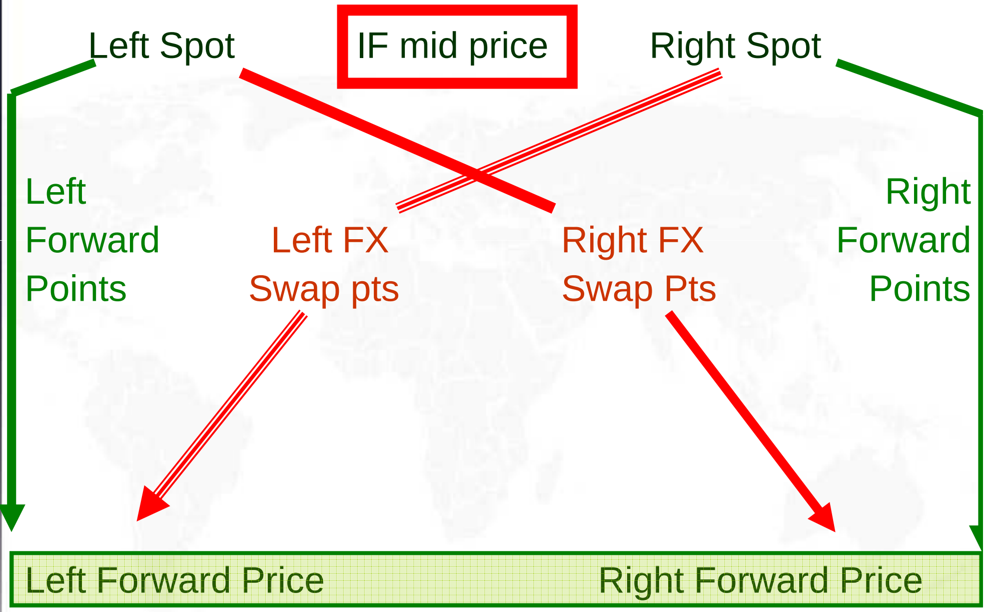

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Forward Points and FX Swap Points

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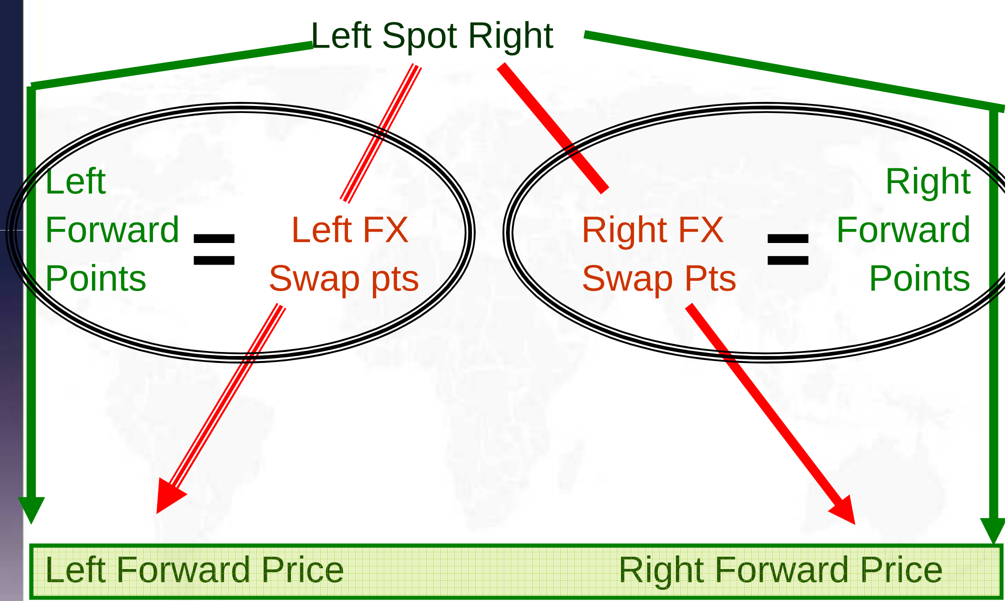

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Example :

I want to sell the USD against the CHF now (Spot date) and I want to buy the same amount of USD against the CHF in 6 months at a fixed price.

Let's consider the mid price of the spot USD/CHF being 1.2350 and the 6 months swaps points being

- 128 to - 123

I have to sell de USD spot at 1,2350
and buy it back on forward 123 points **cheaper**
which is at **1,2227**

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Broken Dates

How to estimate the broken date swap ?

		DAYS	LEFT SWAP	RIGHT SWAP
BEFORE		**91**	**-6,7**	**-6,55**
BROKEN DATE	91	31 **122**	-2,8 0,34 **-7,654**	-2,5 0,34 **-7,385**
AFTER		**182**	**-9,5**	**-9**

$$\frac{31}{91} = 0,34$$

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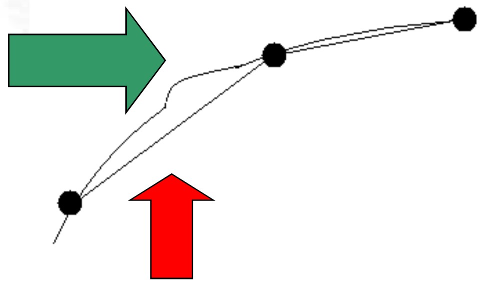
Precious Metals

Broken Dates

The linear interpolation is a pure estimation, it is not reflecting 100% the reality.

1- Because of the **actual shape** of the curve
2- Because of particular **steep** curve
(ex. Turn of the year effect)



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Precious Metals

Arbitrage

We have previously seen that by using the IR we can calculate the forward price of a spot/cross.

Example :

USD/CHF : 1.3517   NZD/USD : 0.5812

NZD/CHF = 0.78561

3 Mths ***(92 days)*** CHF 0.30 3Mths NZD 5.10

Value Spot

1.000.000 NZD → at 0.7856 → **785.608 CHF**

5.10% | 0.30%

Forward points are :

(0.7761 – 0.7856) * 10.000 =

-95 points

1.013.033 NZD | **786.210 CHF**

$$\frac{786.210}{1.013.033} = 0.7761$$

Maturity 3 Mths

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Arbitrage

$$\text{Fwd Pts} = \text{Spot} * \frac{\dfrac{\text{Rate Sub}}{\text{Basis Sub}} - \dfrac{\text{Rate Main}}{\text{Basis Main}}}{\dfrac{100}{\text{Days}} + \dfrac{\text{Rate Main}}{\text{Basis main}}}$$

$$\text{forward rate} = \text{spot rate}\ \frac{1 + \dfrac{\text{interest rate}_{\text{quoted currency}} \times \text{day count}}{\text{annual basis}_{\text{quoted currency}}}}{1 + \dfrac{\text{interest rate}_{\text{base currency}} \times \text{day count}}{\text{annual basis}_{\text{base currency}}}}$$

ACI Official

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Precious Metals

Arbitrage

If every data are unchanged, the market is in equilibrium.

But if just one data has been changed, the whole equilibrium is broken and an arbitrage opportunity automatically appears.

Example :

the quotation of the swap pips moves

from -95 to -96

Value Spot

1.000.000 NZD

at 0.7856

785.608 CHF

5.10%

Forward points are :

(0.7760 – 0.7856) * 10.000 =

-96 points

0.25%

1.013.033 NZD

1.013.033 x **0.7760** =

786.113,87 CHF

Maturity 3 Mths

Arbitrage

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Precious Metals

CROSS CALCULATOR NZD CHF Value 21 9 04

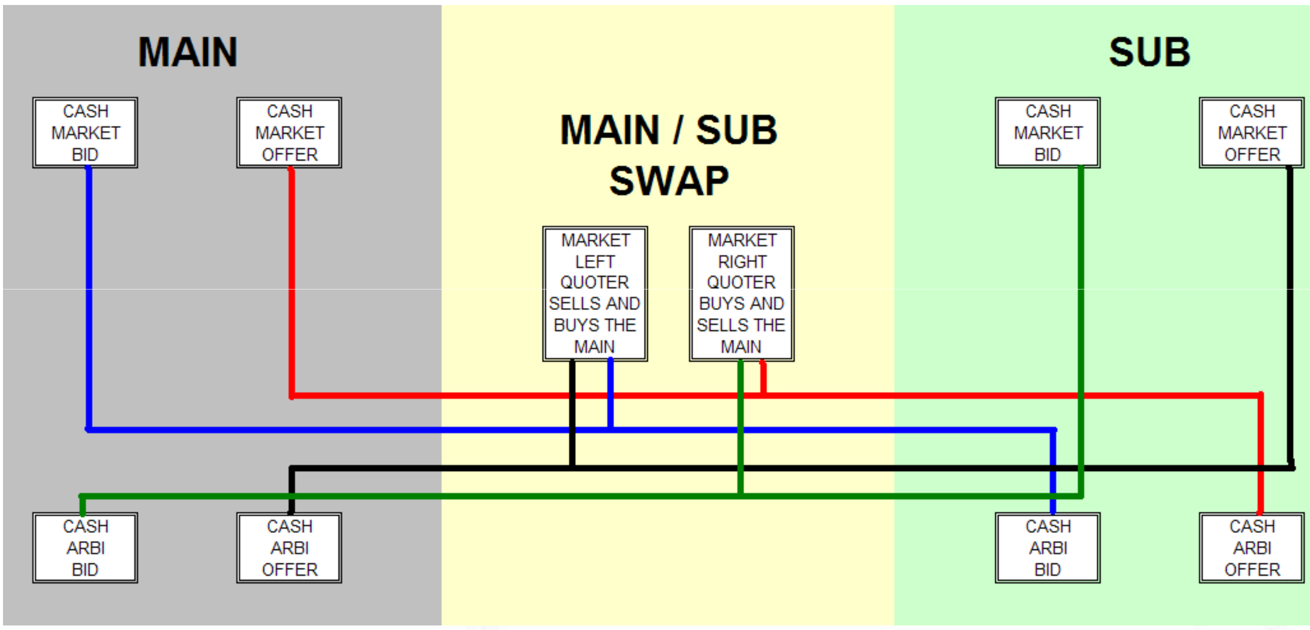
HOW TO GET 3 's CHF AT 0,25595502 | 0,62

The Arbitrager S/B the NZD

OFFER	3 's NZD AT			5,1
WITH		RIGHT	CROSS	-96
SPOT	NZD / CHF			0,7856
DAYS		FX Swap	Diff USD	92

SPOT	21 9 04	0,7856	785,6	CHF	1000	NZD
FWD	22 12 04	0,776	786,1138667	CHF	1013,03333	NZD
		Interest	513 867	CHF	13 033 333	NZD
		Calculation	1000	NZD	785,6	CHF

Arbitrage Main / Sub



Explanations of the “arbi” board

The "market quoter" sells and buys the EUR on the spot at 1.5468 and on the forward at 1.5357

The "market quoter" buys and sells the EUR on the spot at 1.5468 and on the forward at 1.5359

EXAMPLE

		Market Data				1.5467536 CROSS		Arbi Informations			
	Days	EUR		CHF				EUR		CHF	
Per	#days	Bid	Offer	Bid	Offer			Bid	Offer	Bid	Offer
6	182	2.1700	2.2000	0.7300	0.7800	-110.8443	-108.385	2.1310	2.2134	0.7369	0.7985

2.1310

2.2134

0.7369

0.7985

Forward/Forward

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Precious Metals

A question could be :

How can I evaluate the 6 months Forward EUR/CUR but starting in 3 months ?

In other words,

What is the quotation 3 against 9 months Fwd/Fwd EUR/CUR ?

To answer that type of question, I need to know the quotations of the EUR/CUR on spot, in 3M and in 9M

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Precious Metals

Forward/Forward

Using the following market data :

			EUR	CURR
		MID spot	1,755	
1	31	1 MONTH	-9	-7
2	62	2 MONTHS	-5	-3
3	92	3 MONTHS	-1	1
6	184	6 MONTHS	0	1
9	273	9 MONTHS	8	10
12	365	12 MONTHS	15	20

Notice that this curve begins with a DISCOUNT and finish with PREMIUM

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Precious Metals

Forward/Forward

So the forward prices will be:

in 3 months

starting at : 1,7549 = 1,7550 + - 1 pip
1,7551 = 1,7550 + 1 pip

in 9 months

ending at : 1,7558 = 1,7550 + 8 pips
1,7560 = 1,7550 + 10 pips

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Precious Metals

Forward/Forward

then

3/9 Fwd/Fwd EUR/CURR swap points are :

7 to 11 forward

starting at : 1,7549 - 1,7551

ending at : 1,7558 - 1,7560

			EUR	CURR
		MID spot	1,755	
1	31	1 MONTH	-9	-7
2	62	2 MONTHS	-5	-3
3	92	3 MONTHS	-1	1
6	184	6 MONTHS	0	1
9	273	9 MONTHS	8	10
12	365	12 MONTHS	15	20

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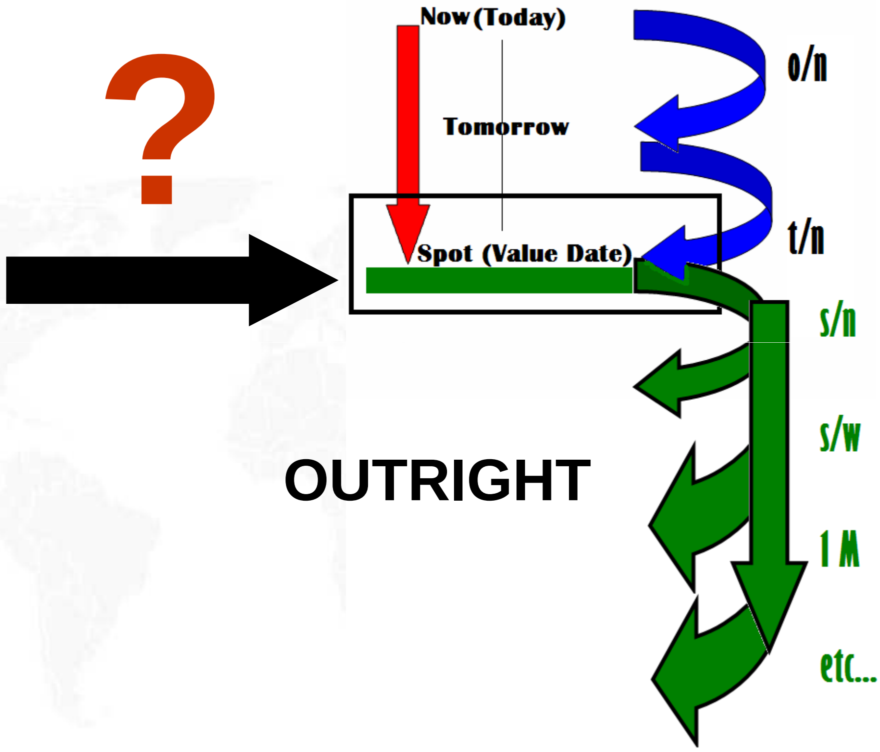
Ante Spot Calculation



Ante Spot Calculation

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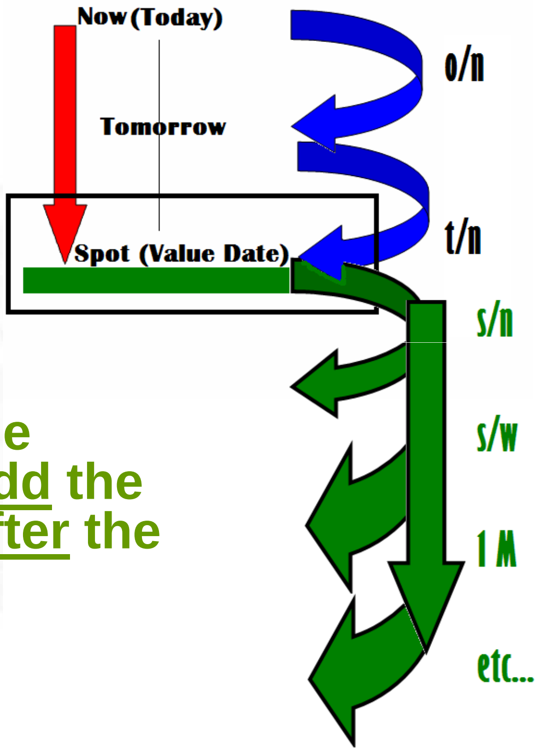
?



+ **To calculate the Forward, we <u>add</u> the swap points <u>after</u> the spot value**

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Ante Spot Calculation

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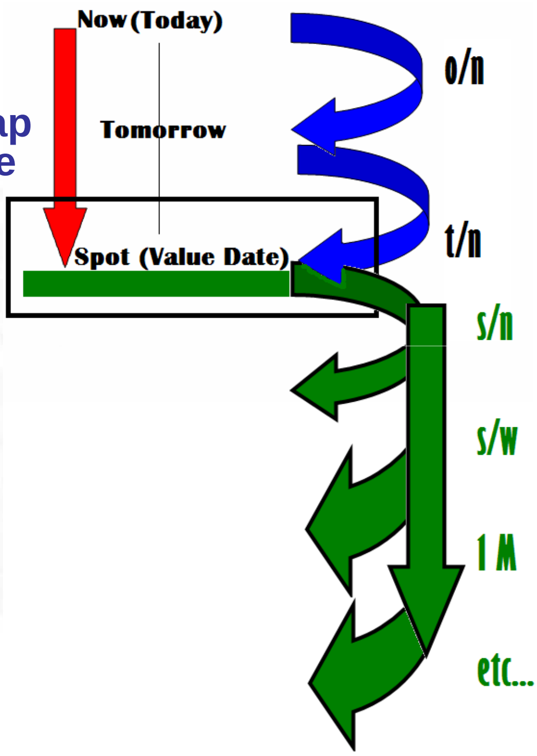
Precious Metals

- **To calculate the Forward, we <u>subtract</u> the swap points <u>before</u> the spot value**



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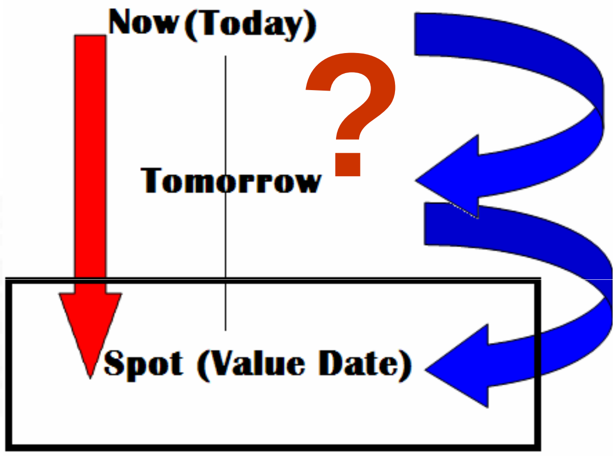

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Ante Spot Calculation

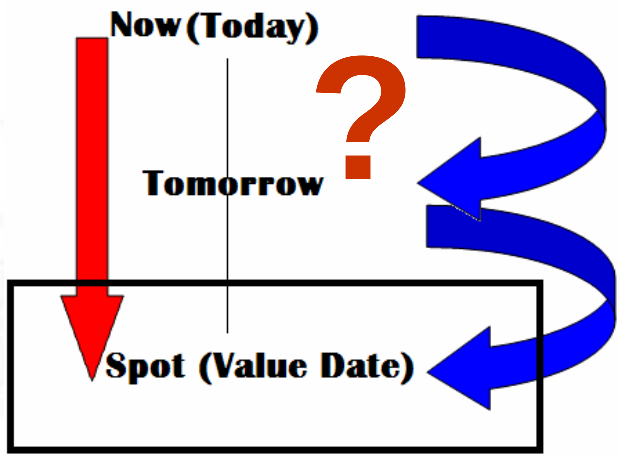
overnight

tom/next

Left Right

swap : -3 -2,5

spot 1,5000 – 1,5010



Ante Spot Calculation

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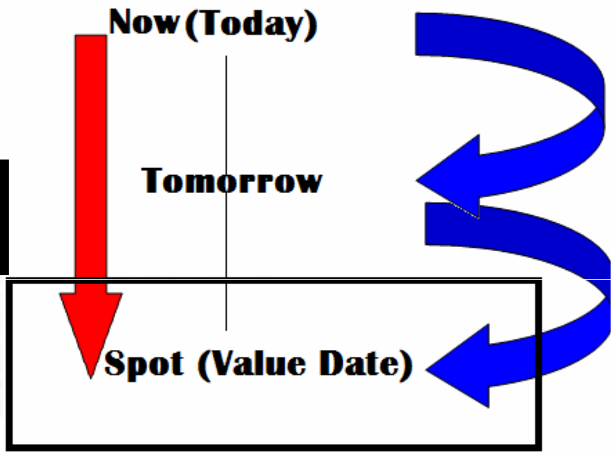
Precious Metals

overnight

Exchange Val Tom
1,50025 - 1,5013

spot **1,5000 – 1,5010**



Time (Delivery) Option Fwd Contract

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Precious Metals

- A very good tool for small/medium companies that have to manage FX exposure in small amounts during a period of time
- It is a forward foreign exchange contact between a bank and a company
- The company can make a deal at any time during the period of time of the time “option” forward contract
- Usually the period of time is no longer than 3 month
- This is NOT an option in the sense of a currency option : the company MUST trade within the period or at the maturity and fully settle the contracted amount.

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Presentation

- Multiple partial trades within the period are possible : this a good way for companies to exchange small currency inflows during the “option” period
- If, at maturity of the forward period, the amount hasn’t been fully traded, the company has to settle the remaining balance
- The remaining balance is traded at the maturity current spot price : this settlement in cash can, obviously, result in a positive result/negative result for the bank or the company (depending on the difference between the future spot price and the contract price)

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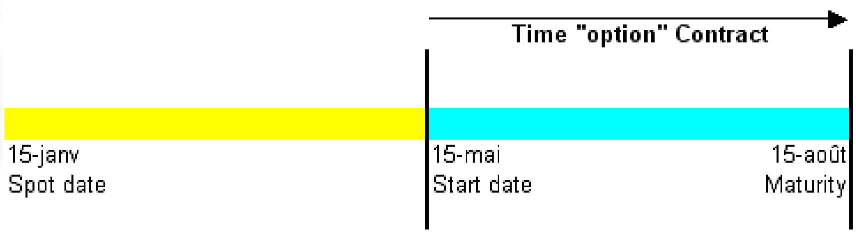
Example

Step 1 : Original trade

A company makes a time “option” forward contract with a bank :

- The spot date is 15/01/N
- The contract runs from the 15/05/N to the 15/08/N
- The company wants to sell 1.000.000 EUR / USD
- The price of the time option forward contact is 1.25



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Precious Metals

Example

Step 2 : During the “option” forward

contract (15/5/N – 15/8/N)

The company has :

- Sold 250.000 EUR/USD on the 25/5/N
- Sold 500.000 EUR/USD on the 13/6/N
- Assuming no other flow, the company must sell to the bank an additional 250.000 EUR/USD on the 15/8/N (the original amount was 1 Mio EUR/USD). The spot price at maturity (15/8/N) is 1.23.
- As the company doesn’t have these EUR, it has to settle the balance with the bank at the 15/8/N spot price of 1.23

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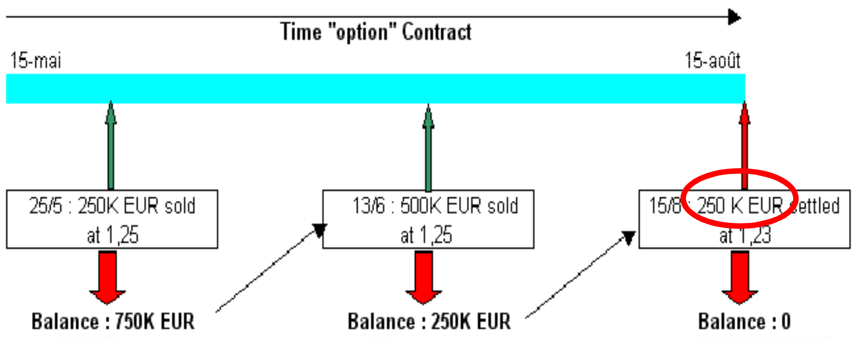
Example

So, we have :



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For the pricing of the forward, the bank will take the most favorable future forward points

If the main currency is at a forward premium
(quotation low-high) :

- If the banks buys the main currency, it will take the forward points at the beginning of the contract period
- If the banks sells the main currency, it will take the forward points at the maturity of the contract period

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If the main currency is at a forward discount
(quotation high-low) :

- If the banks buys the main currency, it will take the forward points at the maturity of the contract period
- If the banks sells the main currency, it will take the forward points at the beginning of the contract period

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- A client wants to make a EUR/ USD time "option" forward contract from the 15/3/N to the 15/6/N
- The spot date is the 15/1/N and the spot EUR/USD is 1.2500
- The EUR is at a forward premium (interest rates in EUR lower than interest rates in USD)
- The forward points are :
  - + 52 on the 15/3/N
  - + 130 bps on the 15/6/N

If the client wants to sell the EUR in the contract, the bank will quote :

1.2500 + 0.0052 = 1.2552

If the client wants to buy the EUR in the contract, the bank will quote :

1.2500 + 0.0130 = 1.2630

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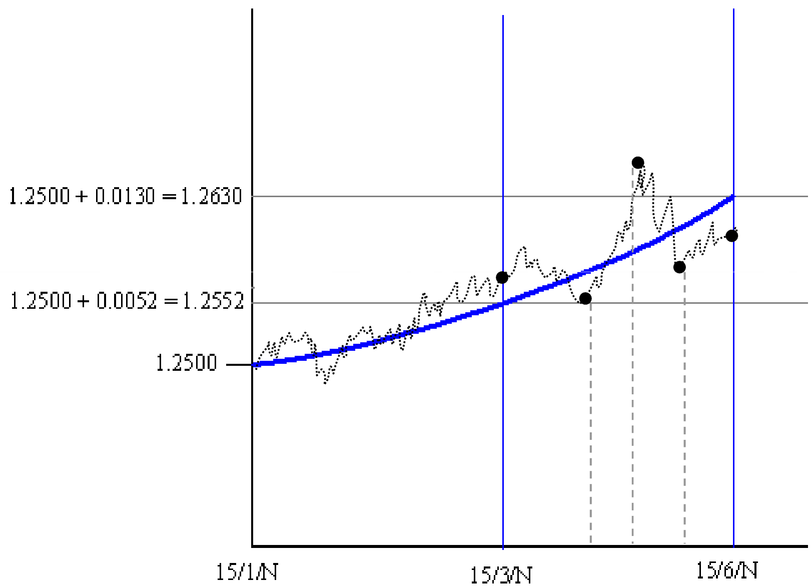

Pricing from the Bank

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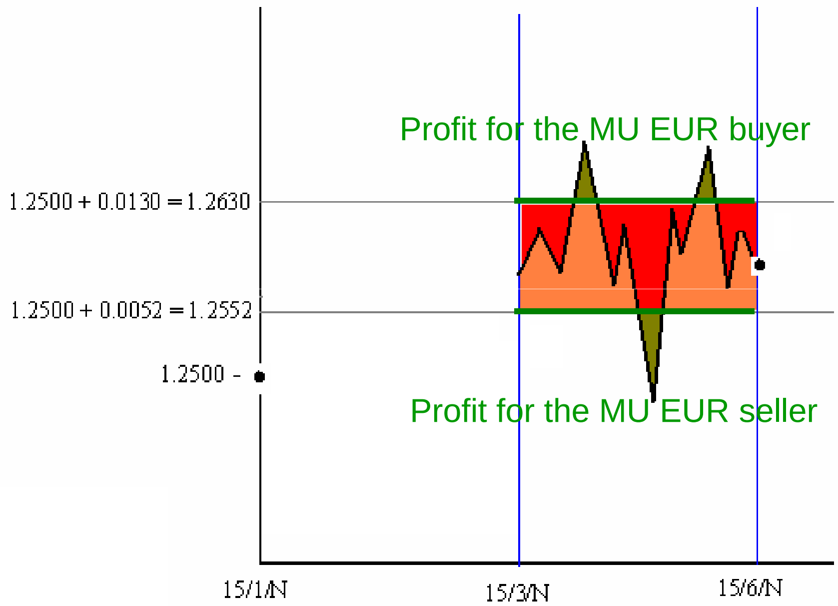

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Spot
Cross
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Aim:

To be able to recognise and use quotes for precious metals, and demonstrate a basic understanding of the structure and operation of the international market in precious metals.

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Candidates should be able to :

- list the commodities called precious metals (gold, silver, platinum and palladium) and give their ISO codes
- describe the conventional method of quoting gold in the international market in US dollars per ounce
- apply a bid/offer spot price as price-maker and price-taker to calculate the value of a given weight of precious metals
- distinguish between precious metals trading for physical delivery and book entry
- distinguish between the spot, forward and derivative markets in precious metals
- outline the mechanics and role of the London gold price fixing
- explain the role of gold lending/borrowing and define the gold offered forward rate or lease rate

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Introduction

This part of the FX focuses on the commodities but only on precious metals :

- Gold
- Silver
- Platinum
- Palladium (part of the Platinum group metal)

- Other platinum group metal are not considered for the Certificate (Ruthenium, Osmium, iridium…)

- All other commodities are excluded from this part : even those listed on the LME (London Metal Exchange : copper, lead, zinc…)

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In this section we will :

- Present the four precious metal and give some information related to them (form, prices, unit conversions, weight conversions…)

- Introduce in greater details the Gold market :

• Market and Actors
• London Fixing
• Instruments :

OTC products : spot, forward, swaps and other derivatives

Organized markets for derivatives

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DEFINITION

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A precious metal can be defined as :

- A rare metallic chemical element of high economic value

- Chemically : precious metal are less reactive than most elements and have higher melting point than other metals

- Historically, precious metal were important as currency (gold, silver) but are now regarded mainly as investment and industrial commodities

- Precious metal have ISO 4217 currency codes : the rule is to put a X + the metal's chemical symbol (please refer to each metal for specific ISO code)

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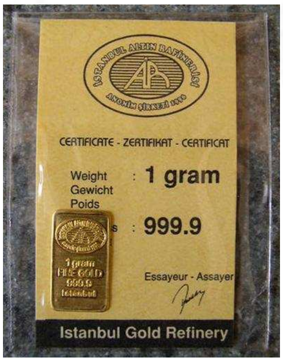
- Bullion is the generic word for gold and silver in bar or ingot form

- Bullion Coins are precious metal coins minted for investment purposes

- The defining attribute of bullion is that it is valued by its mass and purity rather than by a face value as money



- Obviously there is a direct link between purity and dollar value but for delivery purposes, the attribute will be considered (we will talk about fineness : the proportion of precious metal in an alloy, in gold of 995 parts per 1000 fine gold or 9.999 parts gold to 10.000 parts total)

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PRICE AND WEIGHT CONVERSIONS

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- One of the earliest unit of weight for gold was the grain : this is now obsolete and has been replaced by the Troy weight

- The Troy weight originates from the troy system of mass (the name comes from the French city of Troyes, an important trading center in the Middle Ages)

- The rule in the precious metal market is to quote in USD / troy ounce (troy ounce is abbreviated in oz : prices are then in USD per oz)

- Prices can also be expressed in kilos (kilogram or kilogram bar) : we then need to know the unit conversion factors

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- 1 troy ounce (oz) = 31,103 grams
- 1 kilogram = 1.000 grams

► 1 kilogram = 1.000 / 31,103 = 32,151 troy ounces

- 1 kilogram bar 995 fine is then 31,990 troy ounces
  (32,151 * 0,995 = 31,990)
- 1 kilogram bar 9.999 ("four nine") fine is then 32,148 troy ounces
  (32,151 * 0,9999 = 32,148)
- The Pennyweight is an American unit of weight for gold and 20 Pennyweights = one ounce

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Example :

1 gold ounce = 620 $

as 1 kilogram = 32,151 troy ounces

► 1 gold kilogram
= 19.933,62 $ (620 * 32,151)

► 1 gold Kilo Bar (995 fine)
= 19.833,80 (620 * 31,990)

► 1 gold Kilo Bar (9999 fine)
= 19.931,76 (620*32,148)

PRICE AND WEIGHT CONVERSIONS

The carat (or Karat) :

- Unit of mass = measure of the weight of precious stones (1 carat = 0,2053 grams).

- Unit of purity = proportion of gold in a gold alloy :
  - 24 carat (carat is often expressed K) is pure gold
  - 18 K is 75 % pure gold : 18 parts of gold and 6 parts of other metal
  - 14 K is 14 parts gold to 10 parts other metal

In the US, the carat almost exclusively means the unit of mass while Karat almost exclusively means the unit of purity

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GOLD

(the gold market will be detailed in the next section)

- Gold is a soft, shiny, yellow, dense and malleable metal and is a good conductor for heat and electricity

- Gold is used :

- for industrial purposes : jewelry, embroidery, communication, spacecraft, dentistry…

- for monetary purposes : gold is still used as a reserve asset by central banks
- for several reasons (portfolio diversification, public confidence…)

GOLD

- Thanks to history, gold is a very peculiar commodity that plays the role of commodity but also the role of currency
- According to the World Gold Council, the total gold supply in 2005 was of 3.859 tonnes (124 million ounces)
- The chemical symbol is Au (from Latin word aurum) : **the ISO code is then XAU**

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SILVER

- Silver is a soft white lustrous metal which has the highest electrical and thermal conductivity
- Silver is used in jewelry, coins, tableware, photography, mirrors, electrical and electronic products
- Silver price is much more driven by industrial demand than the gold price : silver is primarily a industrial commodity (whereas gold is money !)

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SILVER

- As an industrial commodity, the price of silver fluctuates accordingly to demand : at the end of the 90's, the high-tech demand was strong = silver prices performed better than gold prices. So, the volatility of silver depends on the world's economic cycle (and on speculation, like everything else…)
- In term of value, silver is currently about 1/50th the price of gold by weight and approximately 70 times more than copper

- The world production is around 600 million ounces per year

- The chemical symbol is Ag (from Latin word argentum) :
the ISO code is then XAG

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PLATINUM

- Platinum is a heavy, malleable, grey-white metal very resistant to corrosion
- Platinum is used in jewelry, laboratory equipment, electrical contacts, dentistry and automobile industry
- As it is an extremely rare metal, it cost roughly twice as more than gold. Obviously, price changes with availability and demand

- The world supply is around 6 million ounces per year

- The chemical symbol is PT :

the ISO code is then XPT

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PALLADIUM

- Palladium is a rare silver-white metal of the platinum group among which is has the lowest melting point

- Palladium is used mainly in the automobile industry but also in dentistry, jewelry (it can be alloyed with gold to produce white gold), electronics, surgical instruments

- As Palladium costs around 1/4 of the Platinum price per troy ounce

- The world supply is around 7.5million ounces per year

- The chemical symbol is PD : **the ISO code is then XPD**

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PRICES COMPARISONS

In **September 2006**, the prices for precious metal were around :

- Platinum : $ 1.240 / troy ounce
  ► **$ 39.866** / troy kilos

- Gold : $ 620 / fine troy ounce
  ► **$ 19.933.62** / troy kilos
  (1 troy kilo = 32,151 troy ounces)

- Palladium : $ 344 / troy ounce
  ► **$ 11.059** / troy kilos

- Silver : $ 13 / troy ounce
  ► **$ 418** / troy kilos

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- London is by far the largest global center for OTC transactions, followed by New York, Zurich and Tokyo (the lowest transaction size is typically not less than 1.000 ounces).
- Some centers (like Dubai, Istanbul or Bombay) are also involved in important OTC trading and usually focus on jewelry and small bars trades (one kilogram or less) for private investors
- The OTC market operates 24 hours a day but liquidity will be based on which financial center is open

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The main actors in the market are :

- The central banks and supranational organisations
- The bullion houses and their associations
- The industrial and mining companies

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The Central banks and supranational organisations (IMF, BIS, ECB…) :

- Are very active players in the market as they hold around 20% of above-ground stocks of gold
- They affect the market through their activity of spot dealing, swapping and are the first provider of leased gold in the market.
- Gold (and silver), like any other currency, can be borrowed or lent and the interest is calculated on the basis of troy ounces. The term leasing refers to lending or borrowing without any collateral (as a cash trade) : to avoid confusion with swaps, market players "lend on the lease" or "borrow on the lease"

(please refer to the fixing part concerning the lease rates)

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Even if Central banks have been net seller of gold over the recent years, they still keep gold as a reserve asset (the generally accepted world average for gold reserves is 11% of total central bank reserves) .

Why ?

- Portfolio diversification : diversification obviously reduces risk. The "normal" currencies evolutions depends on many factors like government policies : the price of gold only depends on supply and demand and so evolves in a different way
- Gold will always be liquid : unlike currencies it cannot be subject to any exchange control or restriction and can be used as a collateral for borrowing
- Balance sheet strength : holding gold makes the public and rating agencies comfortable with central banks balance sheets. It globally improves confidence to know that a Central bank holds an indestructible asset

MARKET AND ACTORS

The bullions houses and their associations :

- The bullion houses are institutions active in the market that trade gold for their customers or for their own account

- There are many associations (like the Bombay Bullion Association) but we will focus on the most important one :

the role in the gold (silver) market London Bullion Market Association **(LBMA)** thanks to its prime

CITY OF LONDON

LBMA

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The LBMA :

- The LBMA is totally different from the LME (London Metal Exchange) : the LME trades base metals whereas gold and silver are traded by members of the LBMA (the LME is an exchange but LBMA members trade on a OTC basis)

- Most of the members are international banks, bullion dealers and refiners

- We can distinguish among the members :

  - Market making members : they have to quote two-way prices throughout the day. As all market makers, they insure the liquidity of the market. Among them, 5 members are in charge of the London fixing (please refer to the fixing section below)

  - Ordinary members : they quote prices but have no obligation to quote bid/ask or to quote to other dealers.

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The LBMA :

- Most of the world gold market takes place "loco London" : the gold is sold for delivery in London
  ("loco" : the place where a commodity is physically held)

- The LBMA sets standards for gold bars that can be accepted for "good delivery". The London good delivery bar is a benchmark standard for world gold transactions (as bullion traders all over the world usually have an account with LBMA members).

- The price of gold is in $ / ounce but trades must take place in terms of gold bars : delivery must take place in whole multiple of gold bars

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The LBMA :

The London good delivery bars requirements are :

Gross Weight :	Expressed in multiple of 0.025 ounces. Bars are generally close to 400 ounces (12.44 kilograms)
Content of gold :	350 – 430 fine troy ounces
Fineness :	minimum 995 parts per 1.000 fine gold
Assayers*/Melters stamps :	any approved by the LBMA
Obligatory marks :	a serial number, fineness, assayer and melter stamp of weight to within 0.025 troy ounces
Appearance :	good appearance, free from cavities and easy to handle
Delivery :	usually at one of the London bullion clearing houses

* (assay = the process by which the fineness is determined)

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Example of the fine gold content in a London good delivery bar :

- the bar have a gross weight of 407 ounces
- the fineness is 997.2 *(over 995)*

Then, the fine gold content is
407 * 0,9972 = **405,86 fine ounces**

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The LBMA :

- One of the main role of the LBMA is the maintenance of the London Good Delivery Lists (LGD)
- This lists includes refiners of gold and silver whose standards of production and assaying meet the LBMA standards : their bar can be used for settlement against trades concluded between LBMA members and their clients
- The list is an international benchmark : it provides an international standard for bars delivered worldwide

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The LBMA :

- Like for the FX, there are clearing houses that nets gold transactions but a bullion clearing bank may take physical delivery whereas in the FX market a clearing bank only takes delivery of foreign exchange in the form of an accounting entry

- LBMA clearing houses are mainly the Bank of England, the five houses that fix gold and a few houses that change from time to time. The number of clearing members is usually smaller than the number of market makers, as the financial and other requirements are much stricter.

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The LBMA :

- The functioning market description we made for gold is the same for silver, with some slight differences as it is not the same market. Some of them are :

• The unit of trading for gold is $ / one fine troy ounce whereas it is $/ one ounce for silver. So we are talking about pure gold and for silver we are talking about one ounce of material of which a minimum 999 parts in every 1.000 is silver

• The number of LBMA members conducting the fixing is 3 for silver and not 5

• The London Good Delivery Silver Bar presents different characteristics : weight is expressed in multiples of 0.1 of an ounce, minimum fineness of 999 parts per 1.000, bars generally weight 1.000 ounces (31.1 kilograms)…

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Gold accounts at a bullion house can be **allocated** or **unallocated** :

Allocated accounts :

- The customer's account is detailed (specific bars or coins with their identification in weight, number, fineness…)
- It is just like having a safe : this is the reason why the customer pays charges (insurance and storage) and do not receive interests on it.

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Unallocated accounts :

- This is the most typical account, very close to usual foreign exchange accounts
- The client holds a number of precious metal ounces, but these ounces are not identified by any individual physical bars.
- All clearing accounts are unallocated accounts.
- Most trading takes place through bookkeeping entries : traders clear their trades with one another through book entry transfers with clearing houses (it avoids transaction costs and security risks of moving precious metal). Clearing houses clear their net trades with one another through their gold account at the Bank of England (as well as by physical gold transfers)
- The creditor does not incur charges : it is cheaper than an allocated account but the creditor has a full credit risk exposure on the bullion house

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The industrial and mining companies :

- The industrial represent the demand side for production purposes while the mining companies are on the offer side

- Both of them are active in the market through their purchases and sales, their needs for hedging tools and financing sources

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LONDON FIXING

Presentation :

- Just like LIBOR for other currencies, gold is fixed every day in London (the first fixing took place in 12/09/1919)

- Unlike currencies, gold is fixed twice a day : at 10.30 AM and 3.00 PM. The afternoon fixing is the most important because many markets are open (USA, Europe, Africa and Middle East) and so this is the most liquid period.

- The fixing is the benchmark for pricing the majority of gold products derivatives (industrial contracts, cash settled swap and options…)

- We have to distinguish between two kinds of fixing

  - **The gold fixing in itself**
  - **The gold interest rate fixing**

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THE GOLD FIXING

Presentation :

- The LBMA members who conduct the fixing are :

• HSBC
• Société Générale
• Deustche Bank
• Barclays Capital
• Scotia-Mocatta (part of Bank of Nova Scotia)

Each year, on a rotating basis, one among these five members is the chairman of the Fixing

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THE GOLD FIXING

Fixing mechanism :

- The fixing is an open process : it will start in the morning at 10.30 AM (or 3.00 PM) and last until a single price representing a temporary equilibrium between supply and demand is found

- The fixing is like an open auction and so, ensure a real transparency to market participants

- The tradition was to raise a small Union Jack flag on their desk to pause the fixing process (this indicates a change in interest of one of the clearing member); Now, fixing is made by phone and fixing participants can register a pause by saying the word **"flag"** : at the end, the fixing chairman says "there are no flag, and we're fixed"

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Fixing mechanism : 6 steps

1) Clients and bullion houses place orders to the fixing members before the start of the fixing

2) The fixing members net the orders and communicate their net interest at the fixing

3) The fixing then starts with the chairman suggesting a “trying price”

4) This price is communicated by the fixing members to the market participants who can change their orders (cancel, increase, or decrease their interest) during the fixing process and according to the price evolution

5) The gold price is then adjusted (up / down) according to the new orders until supply and demand is matched : the gold price is then declared “fixed”

6) All the business is then conducted on the basis of this fixing price

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Example of fixing : Gold fixing, September 12, 2006

AM			PM		
USD	STG	EUR	USD	STG	EUR
597,1	319,818	469,123	588	315,84	463,503

(fixing levels are obviously set per troy ounce)

THE GOLD INTEREST RATE FIXING

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- Like for LIBOR rate, interest rates for gold are also fixed in London at 11 am London time
- The rate which is fixed is the GOFO rate : Gold Forward Offered rate
- The GOFO rate is the rate at which contributors are ready to lend gold on swap against USD. Periods available are 1, 2, 3, 6, 12 months
- The GOFO rate is the benchmark for some borrowings / loans agreements, Gold IRS and gold FRAs

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The LBMA members who are responsible for providing fixing rates are the market makers of the LBMA :

- HSBC
- Société Générale
- Deustche Bank
- Barclays Capital
- Scotia-Mocatta (part of Bank of Nova Scotia)
- J Aron & Co (UK)
- JP Morgan Chase bank
- Royal Bank of Canada
- UBS AG

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Fixing Mechanism :

- At 10.30 AM, fixing contributors enter their rates on Reuter : at least 6 members have to enter rates for the means to be calculated

- At 11.00 AM, the mean for each period is established by

- Eliminating the highest rates
- Eliminating the lower rates
- Averaging the remaining rates

REMEMBER

1.000.000 NZD

Value Spot

at 0.7856

785.608 CHF

5.10%

Forward points are :

(0.7760 – 0.7856) * 10.000 =

-96 points

0.25%

1.013.033 NZD

1.013.033 x 0.7760 =

786.113,87 CHF

Maturity 3 Mths

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With a classical FX Swap, we determinate the rate between the forward price and the spot in term of "swap points".

Here we will express that ratio in terms of **Interest Rate** called **GOFO Rate**:

$$FGP = SGP * \left(1 + \frac{GR * Days}{100 * Basis} \right)$$

Where FGP = Forward Gold Price
SGP = Spot Gold Price
GR = Gofo Rate

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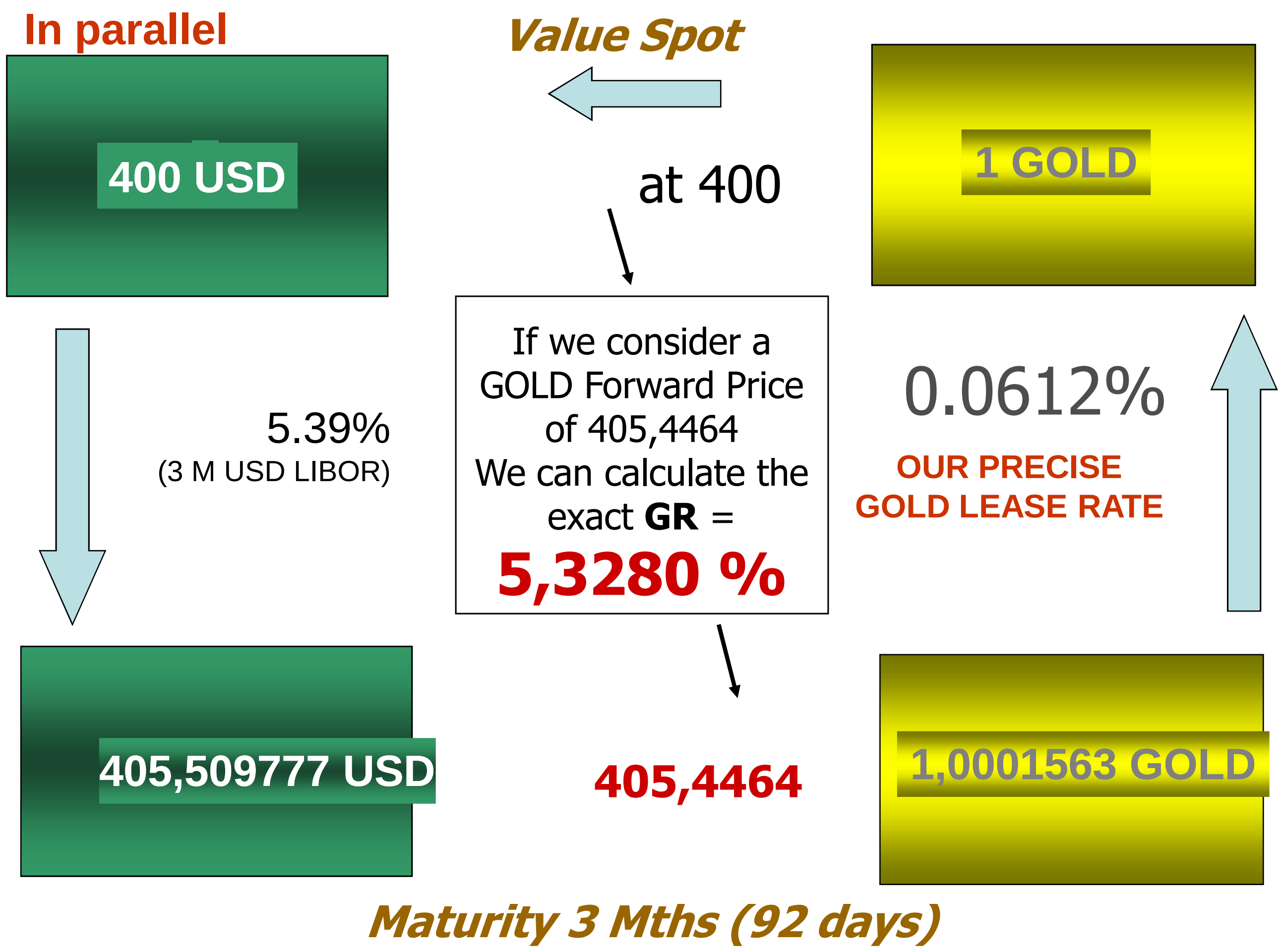
$$\boxed{\text{so} \quad GR = \left\{ \frac{FGP}{SGP} - 1 \right\} \times \frac{100 * Basis}{Days}}$$

Example :

$$\text{so} \quad GR = \left\{ \frac{405{,}4464}{400} - 1 \right\} \times \frac{100 * 360}{92}$$

GR = 5,3280 %



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THE GOLD INTEREST RATE FIXING

Translating this schema into a formula, we can calculate the precise LEASE RATE as being :

Maturity amount for USD invest

$$LR = \left[\frac{1 + \dfrac{\text{USD Libor} * \text{Days}}{36000}}{1 + \dfrac{\text{GR} * \text{Days}}{36000}} - 1\right] * \frac{36000}{\text{Days}}$$

Forward Gold Value

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After simplifications, we obtain :

$$LR = \frac{\text{USD Libor} - \text{Gofo Rate}}{1 + \dfrac{\text{Gofo Rate} * \text{Days}}{36000}}$$

With is the PRESENT VALUE of the difference between the 2 rates (Libor and Gofo)

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CARE the market “application” is to simplify this lease rate to the simple difference in rates (not actualized)

$$LR \approx \frac{\text{USD Libor} - \text{Gofo Rate}}{\cancel{1 + \dfrac{\text{Gofo Rate} * \text{Days}}{36000}}}$$

$$\boxed{LR \approx \text{USD Libor} - \text{Gofo Rate}}$$

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In our previous example

Gofo Rate = 5,3280
USD Libor = 5,3900

$$\text{Lease Rate PV} = \frac{0{,}0620}{1{,}013616} = \mathbf{0{,}0612}$$

Lease Rate ≈ 5,3900 – 5,3280 = **0,0620**

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Example of fixing : Gold GOFO fixing, September 12, 2006

PERIOD	For example GOLD=	400	GOFO RATE	USD LIBOR	THEOR. GOLD LEASE RATE	MARKET GOLD LEASE RATE
1 M	31	401,8173	5,2760	5,3300	0,0538	0,0540
2 M	62	403,6470	5,2940	5,3600	0,0654	0,0660
3 M	92	405,4464	5,3280	5,3900	0,0612	0,0620
6 M	183	410,8458	5,3340	5,4200	0,0837	0,0860
12 M	365	421,5999	5,3260	5,4000	0,0702	0,0740

Here we have a **contango** (report) situation

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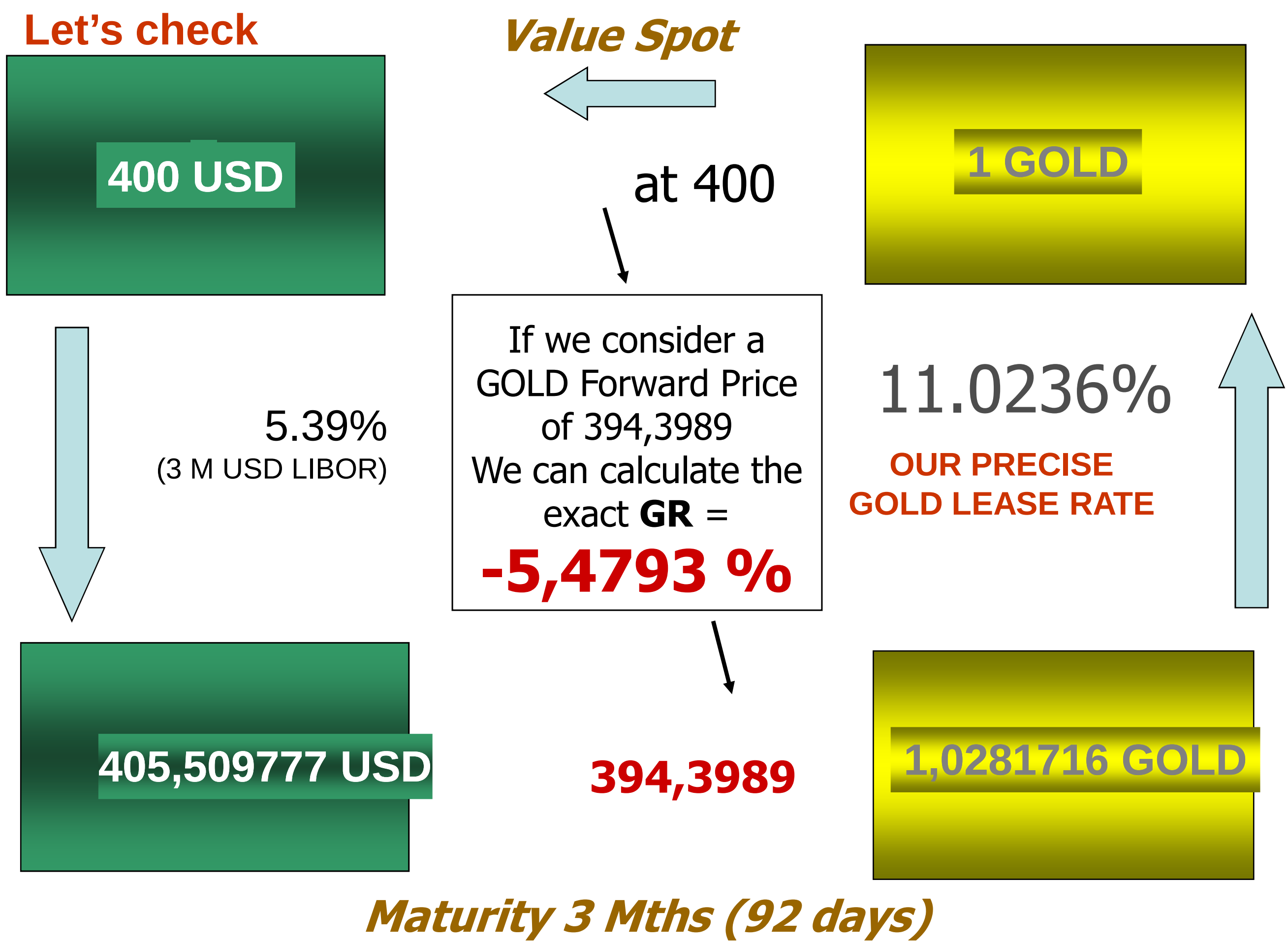
Let's simulate a negative curve of the gold prices

PERIOD	GOLD= (For example)	400	GOFO RATE	USD LIBOR	THEOR. GOLD LEASE RATE	MARKET GOLD LEASE RATE
1 M	31	398,1633	-5,3323	5,3300	10,7115	10,6623
2 M	62	396,2825	-5,3964	5,3600	10,8573	10,7564
3 M	92	394,3989	-5,4793	5,3900	11,0236	10,8693
6 M	183	388,5402	-5,6360	5,4200	11,3820	11,0560
12 M	365	375,9288	-5,9354	5,4000	12,0612	11,3354

Here we would have a **backwardation** (deport) situation



THE GOLD INTEREST RATE FIXING

Thanks to the fixing information, we have :

- The GOFO rate : the rate at which gold can be lent on swaps against USD
- The gold lease rate (≈ LIBOR – GOFO) : the rate at which gold can be lent

It is very important to make the difference between the two rates : one is such as a cash trade rate whereas the other is a swap trade rate

INSTRUMENTS

- As for any currency, gold can be used for trading, hedging or arbitraging purposes
- We will have for Gold all the instruments available in the other currencies : the only difference is that trades can be settled in gold (physical delivery) or in cash
- As other instruments, there is an OTC and an organized market for gold

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OTC INSTRUMENTS

Some Market conventions :

- As said prices are expressed in USD per fine troy ounce (USD per troy ounce for silver). Prices in other currencies or on other units of weight are usually available on request

- Gold and silver interest rate basis are Exact number of days / 360 : which is logical as they are linked to USD interest rates

- Settlement and delivery for spot and forwards deals follow the same rules than for other currencies : two good business days after the deal (a good business day is a day where London is open for gold delivery and New York is open for USD settlement)

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OTC INSTRUMENTS

The spot market :

- Marketable amount are usually 4.000 fine ounces of gold (100.000 ounces in silver)

- Minimum size transactions are usually 2.000 fine ounces of gold

Price :
A quotation of **$597.15** – **$597.35** / oz indicates :

- The market maker buys gold at $597.15 / oz (so, the market user sells gold at this price)

- The market maker sells gold at $597.35 / oz (so, the market user buys gold at this price)

OTC INSTRUMENTS

The spot market : Example

- A trader quotes $597.15 – $597.35 / oz and the price is for ten 400 oz. Bars (= 4.000 ozs of gold)

- The counterparty hits the price at $597.35 = buys gold and sell USD

Then :

- The trader will receive : 10 * 400 * 597.35 = $ 2.389.400

- The buyer will receive 4.000 ozs of gold in two good working days at one of the bullion clearing house

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OTC INSTRUMENTS

The gold borrowing / lending (lease) :

- Gold loan is a mechanism where gold is borrowed from a bullion bank (which may borrows the gold from a central bank) and sold in the market to raise cash for financing (mainly gold mining operations)

- Gold is repaid over an agreed period of time : according to the agreement between parties, the interests can be repaid in USD or in gold.

- Quotations are on a bid / ask basis : the bid is the interest rate for borrowing gold, the ask is the interest rate for lending gold. We talk here about the “bid-asked gold lease rates”

OTC INSTRUMENTS

The gold borrowing / lending (lease) :

Example :
Interest on a gold borrowed on the lease repaid in gold

- Gold borrowing rate is 1 % per annum
- Borrowing period = 180 days
- Amount borrowed = 4.000 ozs

Interests are : 1 * (180 / 36000) * 4.000 = 20 ounces of fine gold

OTC INSTRUMENTS

The outright forwards and swaps :

- The market convention is forwards prices are quoted in interest terms on the basis at which the dealer will borrow or lend gold on the swap

- A market price in the 6 month gold swap of 5.28 – 36 means :

- At 5.28 the trader (*user*) B/S gold and receive an interest on the forward leg of 5.28%

- At 5.36 the trader *(user)* S/B gold and pay an interest on the forward leg of 5.36%

OTC INSTRUMENTS

The outrights forwards and swaps :

Example :

- The middle of the spot price for gold is $ 600 / oz
- The 6 month gold swap is 5.28 – 36
- The 6 month has 182 days
- The forward rates are :

Bid : 600 * (1 + (5.28 * (182 / 36000)) = 616.02

Ask : 600 * (1 + (5.36 * (182 / 36000)) = 616.25

So :

- At 5.28 : the trader B/S gold and will receive an interest of $16.02
- At 5.36 : the trader S/B gold and will pay an interest of $16.25

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The outrights forwards and swaps :

- To avoid arbitrages, there has to be an equilibrium between the gold lease rate and the forward/swap rates : which is the purpose of the GOFO and the implied lease rate (LIBOR – GOFO)
- The forward rate is then the difference between the dollar rate and the gold lease rate
- Two English terms often used in gold (and in other markets) :

- **CONTANGO** : the forward (future) delivery price is greater than the spot price (which is almost always the case with gold)
- **BACKWARDATION** : the forward (future) delivery price is lower than the spot price (it might be explained by an anticipation of supply shortage)

OTC INSTRUMENTS

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Other OTC derivatives products :

- Gold FRA : it works exactly like a FRA (quotes, settlement computation…) and the reference rate is the gold lease rate (LIBOR – GOFO) and is usually settled in USD
- Gold IRS : again it is exactly an IRS and , like FRA, the reference rate is the gold lease rate and is usually settled in USD
- Gold options : we find there all the usual options

To take into account the documentation of these products on gold, there is an ISDA Bullion Definitions : in 1997, the ISDA and LBMA built an addendum to the ISDA Master Agreement to cover bullion terms.

ORGANIZED MARKETS INSTRUMENTS

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Gold derivatives (options and futures) are listed in some major commodity markets.

The main future exchanges are :

- The CBOT (Chicago Board of Trade)
- The COMEX (New York Commodity Exchange), a NYMEX division
- The TOCOM (Tokyo Commodity Market)
- The DGCX (Dubai Gold and Commodity Exchange)

Each exchange, like for other products, has its own requirements in term of contract specification, margin requirement, delivery specifications…

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Let's stop dreaming …

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ACI Dealing Certificates

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1. Basic Interest Rate Calculations
2. Cash Money Markets
3. Foreign Exchange
4. Forward-forwards, FRAs and Money Market Futures & Swaps
5. Options
6. Principles of Risk
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Forward-forwards, FRAs and Money Market Futures & Swaps

CHAP 4
Fwd/Fwd, FRA, Fut, Swaps

Forward/Forward I R

FRA

MM Futures

Swaps

Aim:

To understand the mechanics
of and how
to use Money Market
Interest Rate Derivatives
to hedge Interest Rate risk.

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Forward-forwards, FRAs and Money Market Futures & Swaps

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Candidates should be able to:

- describe the mechanics and explain the terminology of a forward-forward loan or deposit, and the interest rate risk created by such instruments
- explain how FRAs, money market futures and money market swaps are derivatives of forward-forward positions, and outline the advantages of derivatives
- describe the mechanics and terminology of FRAs, use quoted prices, select the correct contract, decide whether to buy and sell, identify the settlement rate and calculate the settlement amount
- explain how FRAs can be used to hedge interest rate risk
- describe the mechanics and terminology of money market futures, use quoted prices, select the correct contract, decide whether to buy and sell, identify the settlement rate and calculate variation margin payments
- explain how money market futures can be used to hedge interest rate risk
- give the contract specifications of the eurodollar, 3-month Euribor, short sterling, euro-Swiss franc and Japanese euroyen futures
- outline the principal differences between OTC instruments like FRAs and exchange traded instruments like futures, and describe how a futures exchange and clearing house works
- describe the mechanics and terminology of money market interest rate swaps, including overnight indexed swaps (OIS), use quoted prices, select the correct contract, decide whether to buy and sell, identify the settlement rate and calculate settlement amounts
- explain how swaps can be used to hedge interest rate risk
- explain how money market futures can be used to hedge and price FRAs and money market swaps
- identify the overnight indexes (OI) for euro, sterling, Swiss francs and US dollars.

Forward-forwards, FRAs and Money Market Futures & Swaps

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- Formulas
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- Use : Hedging
- Use : Arbitrage
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- EONIA
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- Risk and Pitfalls

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We can define the Forward/Forward in the following way :

- A cash deposit or loan
- Starting at a future date and ending in the future
- Everything is fixed in advance :
  - The currency
  - The term
  - The amount
  - The interest rate

Presentation

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Fwd/Fwd, FRA, Fut, Swaps

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It is important to understand the way the term is expressed.

For example :

- A **1/4** Fwd/Fwd loan : this is a loan that will start in one month and end in four months
- A **2/5** Fwd/Fwd loan : this is a loan that will start in two months and end in five months
- A **6/9** Fwd/Fwd loan : this is a loan that will start in six months and end in nine months
- A **6/12** Fwd/Fwd loan : this is a loan that will start in six months and end in twelve months

If not clearly specified, the dates in the future are the period dates (1 M, 2 M, 3M...) according to the valid spot date.

We will have the same term designations for FRAs.

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Example :
we want to make a **3/6 Fwd/Fwd loan**.

- We are the 6th of June 2006. The spot date is the 8th of June
- The three month ends the 8th of September
- The six month ends the **8th of December**

The dates for the 3/6 Fwd/Fwd loan are
08/09/2006 – 08/12/2006

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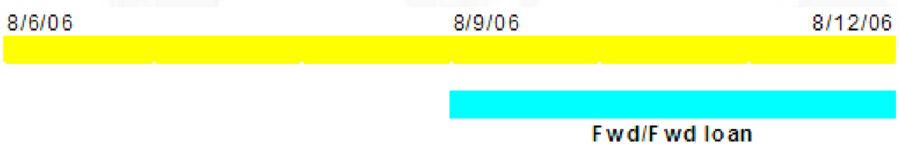
we want to make a 3/6 Fwd/Fwd loan.

- We are the 6th of June 2006. The spot date is the 8th of June
- The three month ends the 8th of September
- The six month ends the 8th of December

The dates for the 3/6 Fwd/Fwd loan are



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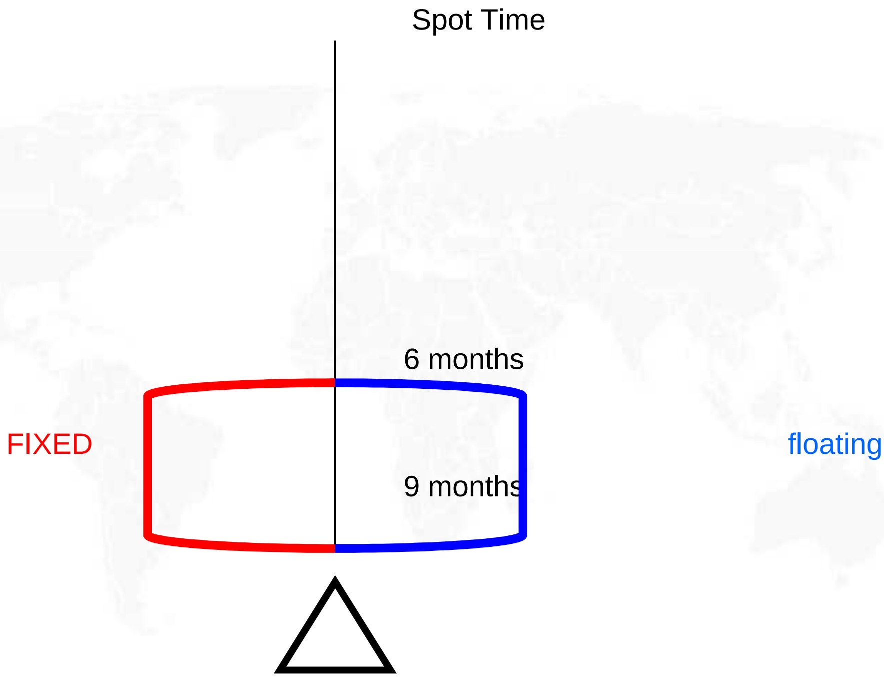

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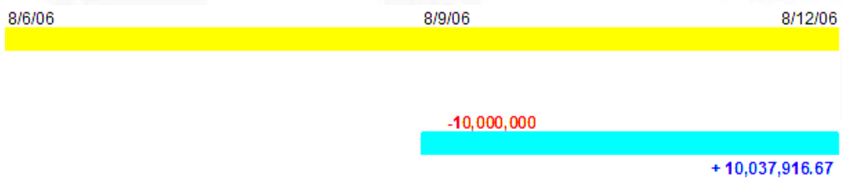
Example :

- According to the previous dates, a bank makes a 3/6 Fwd/Fwd loan
- Dates are 8/9/06 – 8/12/06 (91 days)
- The bank deals in CHF 10 Millions at 1.50 %
- The interests are : 10.000.000 * (0.015 * 91 / 360) = 37.916.67 CHF

We then have the following flows for the bank :



We have full cash transfers (capital and interests) !!!

Formula

This is a first way to find the price for a Fwd/Fwd :

Fwd/Fwd =

$$\boxed{\{ [(1 + ((r2 * T2) / B)) / (1 + ((r1 * T1) / B))] – 1 \} * (B / T3)}$$

- r1 = R1/100 rate of the first period (short period)
- T1 = number of days of the first period
- r2 = R2/100 rate of the maturity period (long period)
- T2 = number of days of the long period
- T3 = number of days of the Fwd/Fwd period (T3 = T2 – T1)
- B = currency basis

FORMULA AVAILABLE AT THE EXAMINATION

$$\text{forward - forward rate} = \left[\frac{1+\dfrac{\text{interest rate}_{\text{long period}} \times \text{day count}_{\text{long period}}}{\text{annual basis}}}{1+\dfrac{\text{interest rate}_{\text{short period}} \times \text{day count}_{\text{short period}}}{\text{annual basis}}}-1\right]\frac{\text{annual basis}}{\text{day count}_{\text{forward-forward period}}}$$

Example

We have the following information available in the market (for the moment we don’t take into account bids and offers) :

- The 3 month has 91 days ⇒ T1
- The 3 month GBP is 4.62 % ⇒ R1
- The 6 month GBP has 183 days ⇒ T2
- The 6 month GBP is 4.85 % ⇒ R2
- The 6 month has 183 days ⇒ T3 = 183 – 91
- The basis for GBP is 365 ⇒ B

Then the 3/6 Fwd/Fwd cash is :

3/6 Fwd/Fwd =

{ [(1 + ((4.85% * 183) / 365))/(1 + ((4.62% * 91) / 365))] – 1 } * (365 / 92)

⇒ 3/6 Fwd/Fwd = **5.019 %**

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Short Synthetic Position From CASH

Our goal here is to build up a synthetic short Fwd/Fwd from 2 cash trades

We have the following information available in the market :

- The 2 month has 61 days
- The 2 month USD is 4.85 - 91
- The 5 month has 153 days
- The 5 month USD is 4.99 – 04

How can we build a short 2/5 USD Fwd/Fwd ?

What will be the rate of the short 2/5 Fwd/Fwd?

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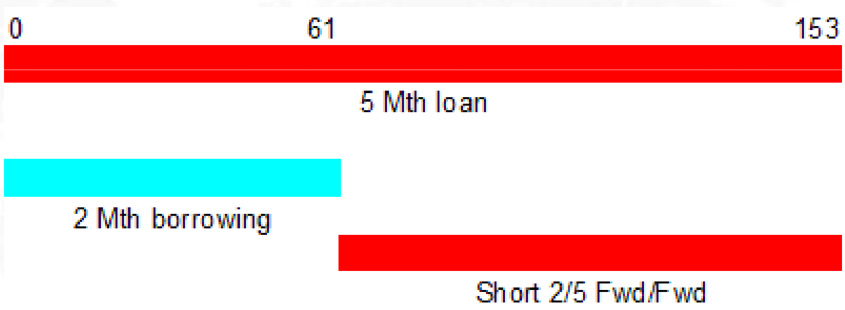
Short Synthetic Position From CASH

To have a short 2/5 Fwd/Fwd USD, we must :
- Lend the 5 month
- Borrow the 2 Month



Short Synthetic Position From CASH

So, we :

- Lend the 5 month at 4.99 (the quotation was 4.99 – 5.04)
- Take the 2 month at 4.91 (the quotation was 4.85 – 4.91)
- The fwd/Fwd has 92 days (153 – 61)

The price of the Fwd/Fwd is :

2/5 Fwd/Fwd =

[(4.99% + ((4.99% – 4.91%) * (61 / 92)] / [1 + (4.91% * (61 / 360))]

⇨ the short 2/5 Fwd/Fwd = **5.001 %**

Short Synthetic Position From CASH

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Let's check if we are right :

- the 2 month is 4.91% and 61 days
- the 2/5 is 5.001 and 92 days

So, the 5 month should be :

{[((1 + (4.91 * 61 / 36000)) * (1 + (5.001 * 92 / 36000))] – 1} * 360/153

⇨ **the 5 Mths = 4.99 %**

Long Synthetic Position From CASH

Our goal here is to build up a synthetic long Fwd/Fwd from 2 cash trades

We have the following information available in the market :

- The 3 month has 91 days
- The 3 month JPY is 0.12 - 17
- The 9 month has 274 days
- The 9 month JPY is 0.18 – 23

How can we build a long 3/9 JPY Fwd/Fwd ?
What will be the rate of the long 3/9 Fwd/Fwd?

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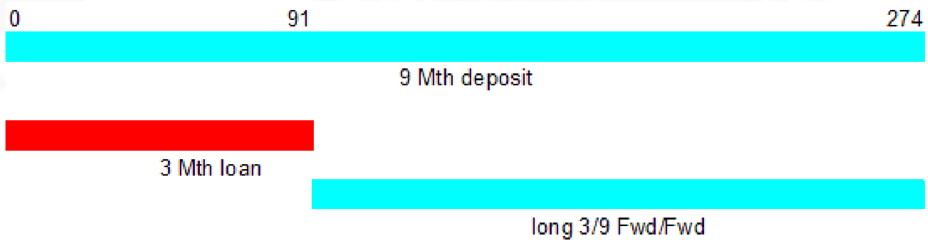
Long Synthetic Position From CASH

To have a long 3/9 Fwd/Fwd JPY, we must :

- Lend the 3 month
- Borrow the 9 Month



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Long Synthetic Position From CASH

So, we :

- Lend the 3 month at 0.12 (the quotation was 0.12 – 0.17)
- Take the 9 month at 0.23 (the quotation was 0.18 – 0.23)
- The fwd/Fwd has 183 days (274 – 91)

The price of the Fwd/Fwd is :

3/9 Fwd/Fwd =

[(0.23% + ((0.23% – 0.12%) * (91 / 183)] / [1 + (0.12% * (91 / 360))]

⇨ the long 3/9 Fwd/Fwd = **0.284 %**

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Long Synthetic Position From CASH

IV 1 IV 2

Let's check if we are right :

- the 3 month is 0.12% and 91 days
- the 3/9 is 0.284% and 183 days

So, the 9 month should be :

{[((1 + (0.12 * 91 / 36000)) * (1 + (0.284 * 183 / 36000))] – 1} * 360/274

⇨ the 9 Mth = **0.23 %**

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RISKS AND PITFALLS

We have almost the same risks and pitfalls than for cash trades :

- This deal involves a full cash payment : it is **heavy** in term of credit limit utilisation (full impact on the credit line)

- **There is a double default risk :**

  - for the **borrower** : he is not sure to have its cash if the lender goes bankruptcy before the start of the Fwd/Fwd
  - for the **lender** : he is not sure to have its cash back if the borrower goes bankruptcy before the repayment of capital + interests at the end of the Fwd/Fwd

- As for any asset bearing interest, we have an interest rate exposure (gap, mismatch, …)

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Forward Rate Agreement

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Presentation

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Swaps

- Derivative products : cover risk with no full cash transfers
- Off balance sheet instruments
- The cash transfer is only the payment of interest rate differential
- And so, the nominal amount will be called a “notional” amount
- Start at the future date and ends at a future date
- Hedging, Trading and Arbitrages
- From futures commodities in 1848 (CBOT) to interest-bearing contracts in 1975
- A forward contract : an **o**ver-**t**he-**c**ounter operation (an agreement between two individuals)
- A future contract : a standardized contract concluded in an ***organized market***

Presentation : OVER-THE-COUNTER MARKET FOR FRA

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Swaps

- Individual dealing
- Flexibility : tailored products
- Credit line utilization
- Sometimes more liquid for far dates than futures (which mainly concentrate on a few contracts)
- Warning : as for other products, a price in London is quoted in reverse way (a 3/6 FRA is quoted 3.66 – 69 in continental Europe but 3.69 – 66 in the UK)

Presentation : FORWARD RATE AGREEMENT

- As for futures : fix the future interest rate for lending or borrowing
- Cash exchange : payment of the interest differential (discounted basis)
- Computation rule : Exact number of days / Currency basis (same than for cash)
- Future long position : sell FRA to protect against a decrease in rates
- Future short position : buy FRA to protect against an increase in rates

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FRA SETTLEMENT FORMULA

The general formula to determine the amount to be paid (on a discounted basis) is

$$\boxed{P = (V * ((I2 - I1) * D)) / (B + (I2 * D))}$$

- P = payment due
- V = nominal amount of the FRA contract
- I1 = FRA interest rate
- I2 = interest rate at the fixing date
- D = FRA number of days
- B = currency basis

FORMULA AVAILABLE AT THE EXAMINATION

Formulas

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ILLUSTRATION OF THIS FORMULA

It is the difference between the interest pre-fixed (FRAr) -A-

and the actual rate (FIXING) -B-

but paid upfront (actualized at Fixing date using the Fixing Rate) -C-

$$\frac{\underbrace{\frac{N * FRAr * Days}{36000}}_{-A-} - \underbrace{\frac{N * Fixing * Days}{36000}}_{-B-}}{\underbrace{1 + \frac{Fixing * Days}{36000}}_{-C-}}$$

Synthetic Cash Trade

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$$\left\{ N + \frac{\frac{N * FRA_r * Days}{36000} - \frac{N * Fixing * Days}{36000}}{1 + \frac{Fixing * Days}{36000}} \right\} * \left\{ 1 + \frac{Fixing * Days}{36000} \right\}$$

$$N * \left\{ 1 + \frac{Fixing * Days}{36000} \right\} + \left\{ \frac{N * FRA_r * Days}{36000} - \frac{N * Fixing * Days}{36000} \right\}$$

$$N * \left\{ 1 + \frac{\{Fixing + FRA_r - Fixing\} * Days}{36000} \right\}$$

$$\boxed{N * \left\{ 1 + \frac{FRA_r * Days}{36000} \right\}}$$

Formulas

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FRA SETTLEMENT FORMULA EXAMPLE

- Bank A bought from bank B a FRA 10 Millions GBP, 182 days at a rate of 5%
- The fixing rate is 5.30%
- Then bank B has to pay to bank A :

P = (10.000.000 * ((0,053 – 0,05) * 182)) / (365 + (0.053 * 182))

P = 14.573,76 GBP

Formulas

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FRA SETTLEMENT FORMULA EXAMPLE

- The FRA offsets the interest rate increase
- The bank A receives 14.573,76 GBP

To borrow 10.000.000 at 5 % during 182 days has a cost of :

10.000.000 * 0.05 * 182 / 365 = 249.315,07 GBP

To borrow 10.000.000 at 5.30 % during 182 days has a cost of :

10.000.000 * 0.0530 * 182 / 365 = 264.273,97 GBP

Formulas

FRA SETTLEMENT FORMULA EXAMPLE

- Considering the payment received, the cost of borrowing for bank A, at 5.30 %, is :

264.273,97 - 14.573,76 = 249.700,21

- The cost of borrowing with 5% was only 249.315,07 GBP
- We have a difference of :

249.700,21 – 249.315,07 = 385,14 GBP

- The payment of 0,30% doesn't match exactly the rate increase

WHY ???

Formulas

FRA SETTLEMENT FORMULA EXAMPLE

IV 3

- Bank A receives the payment for the FRA on a discounted basis
- Bank A **has to reinvest** this payment during 182 days **at the LIBOR** to guarantee the FRA rate:

14.573,76 * 0.053 * 182/365 = 385,14 GBP

- 385,14 GBP is exactly the extra cost we had on the previous slide

the FRA has really fixed the future borrowing rate at 5%

(Remember assuming that we can reinvest at the LIBOR rate, which is not the usual case)

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IMPACT ON CREDIT LINE

As we saw, there is a payment of 14.573,76 GBP for a nominal amount of 10 M GBP :

- It explains why the FRA has an impact on the counterpart credit line
- This impact vary from bank to bank (can be 2%, 3%, 4%…)
- It depends on the bank policy concerning default risk

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IMPACT ON CREDIT LINE

Example :

- bank A sells for 10 Mio Euros FRA to bank B, bank A impacts credit line for 3% for FRA
- The credit line that bank A has for bank B is 100 Mio EUR
- Until the payment of interests after the fixing , bank A will have credit limit left for bank B of 97 Mio EUR (100.000.000 – (10.000.000 * 0.03))

Use of FRA

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Swaps

As all the financial instruments, FRA can be used for :

- **Trading** (open position in the market)
- **Hedging** (protection against an evolution in interest rates)
- **Arbitrage** (taking advantage of a short time discrepancy between two instruments)

Use of FRA : TRADING

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Swaps

- As we have a very small cash utilization, FRAs are a very good tool for trading
- The two trading strategies are :
  - Play a trend
  - Play the curve

Use of FRA : TRADING

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Swaps

If we want to play a trend, we can :

- **Buy** a FRA if we anticipate an **increase** in rates
- **Sell** a FRA if we anticipate a **decrease** in rates

Use of FRA : TRADING

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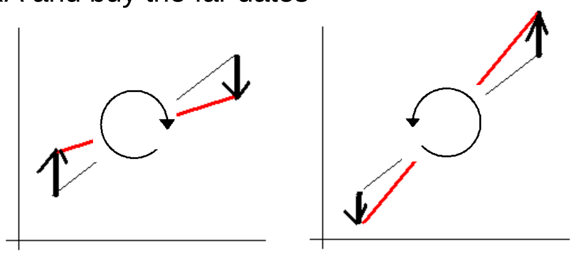
Swaps

We can also play the evolution of the curve :

- If we anticipate a **flattening** of the yield curve : we buy near dates FRA and sell the far dates
- If we anticipate a **steepening** of the yield curve : we sell near dates FRA and buy the far dates



Flattening **steepening**

This strategy is known as a calendar spread : we anticipate a change in the shape of the curve but we don't know if rates will come up or down

Use of FRA : TRADING

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Swaps

- We anticipate a flattening of the EUR yield curve
- We have the following data in the market :

PERIOD	DAYS	RATE
1 MTH	31	2,56
2 MTH	61	2,68
3 MTH	92	2,8
4 MTH	122	2,92
5 MTH	153	3,04
6 MTH	183	3,16
7 MTH	213	3,28
8 MTH	244	3,4
9 MTH	274	3,52
10 MTH	305	3,64
11 MTH	335	3,76
12 MTH	365	3,88

Use of FRA : TRADING

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Swaps

Assuming no arbitrage between cash and FRAs, what are the prices of :

- The 3/6 FRA ???
- The 9/12 FRA ???

Actually, we use the fwd/fwd cash calculation

Use of FRA : TRADING

- The 3/6 FRA (91 days) quotes :
  3.48 – 52 (price from the curve 3.50)

- The 9/12 FRA (91 days) quotes :
  4.81 – 85 (price from the curve 4.83)

We play the flattening of the curve
so what do we do ?

Use of FRA : TRADING

- We buy the near FRA : the 3/6 at 3.52
- We sell the far FRA : the 9/12 at 4.81

After one month,
the yield curve has flattened and we have :

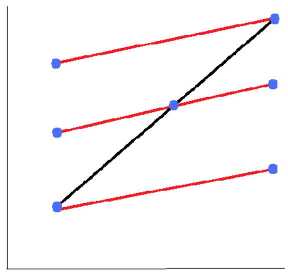
PERIOD	DAYS	RATE
1 MTH	31	2,56
2 MTH	62	2,62
3 MTH	92	2,68
4 MTH	122	2,74
5 MTH	153	2,8
6 MTH	183	2,86
7 MTH	213	2,92
8 MTH	244	2,98
9 MTH	274	3,04
10 MTH	305	3,1
11 MTH	335	3,16
12 MTH	365	3,22

Use of FRA : TRADING

- Our 3/6 is now a 2/5 and it quotes : 2.89 – 93 ((price from the curve 2.91)
- Our 9/12 is now a 8/11 and it quotes : 3.55 –59 (price from the curve 3.57)

Now we take our profit :

- We lose in the 2/5 : - 63 Bps (2.89 – 3.52)
- We win in the 8/11 : + 122 Bps (4.81 – 3.59)
- We have a total profit of **59 Bps**



Use of FRA : HEDGING

- We can hedge cash trades with FRAs
- For that, we will construct a strip : a compounding of short periods to build a long period
- For the next example, we assume that the FRA curve is equal to the cash curve (we will see arbitrages later on)

Use of FRA : HEDGING

In GBP, we have the following data available in the market :

PERIOD	DAYS	RATE	
1 MTH		31	4,5
4 MTH		122	4,61
7 MTH		213	4,72

(to ease computations, we don't take into account bid and offer)

From these information, assuming the price of FRAs are equal to cash prices, we have :

- The 1/4 GBP is 4.63 (91 days)
- The 4/7 GBP is 4.79 (91 days)

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Use of FRA : HEDGING

- A bank has lent 10 Millions GBP 7 month (213 days) at 4.72

- The bank wants a hedge with FRAs

How can we build up the hedge ?

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Use of FRA : HEDGING

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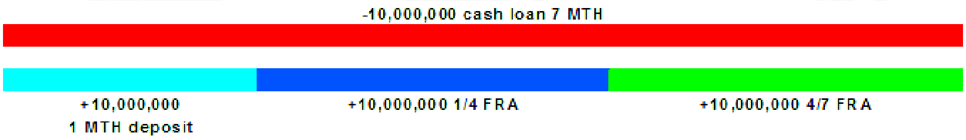
Swaps

- The bank will use a strip of cash and FRAs to hedge its exposure
- The bank borrows the 1 Month (4.5%), takes the 1/4 FRA (4.63%) and takes the 4/7 FRA (4.79%)

We then have :



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Use of FRA : HEDGING

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Swaps

- With our loan, the bank was short at 4.72
- With the hedge, the bank is long at :

{[(1 + ((4.5 * 31) / 36500) * (1 + ((4.63 * 91) / 36500) * ((1 + ((4.79 * 91) / 36500)] – 1 }* (365 / 213)

⇒ **4.72 %**

- In the real life, the bank would have probably done a 1/7 FRA
- Assuming, as we saw, that the bank is able to borrow or invest the discounted payments on the FRAs at LIBOR, the hedge is perfect

Use of FRA : ARBITRAGE

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Swaps

- Very usual arbitrage intending to hedge a cash position (with profit !!!).
- Discrepancies between the cash and future markets
- Neutralization of the exposure of the longest period through the compound interest of the shorter periods.

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Use of FRA : ARBITRAGE

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- A bank has borrowed 10 M Euros in the three month (91 days) at 3.10%
- Long position in the 3 month (exposure to interest rate decrease)
- The bank has lent the same amount in the six month (183 days) at 3.5%.
- Short position in the 6 month (exposure to interest rate increase)

Global position : short in the 3 month in 3 months (exposure to interest rate increase)

Use of FRA : ARBITRAGE

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Swaps

Situation :

-10,000,000 loan 6 MTH

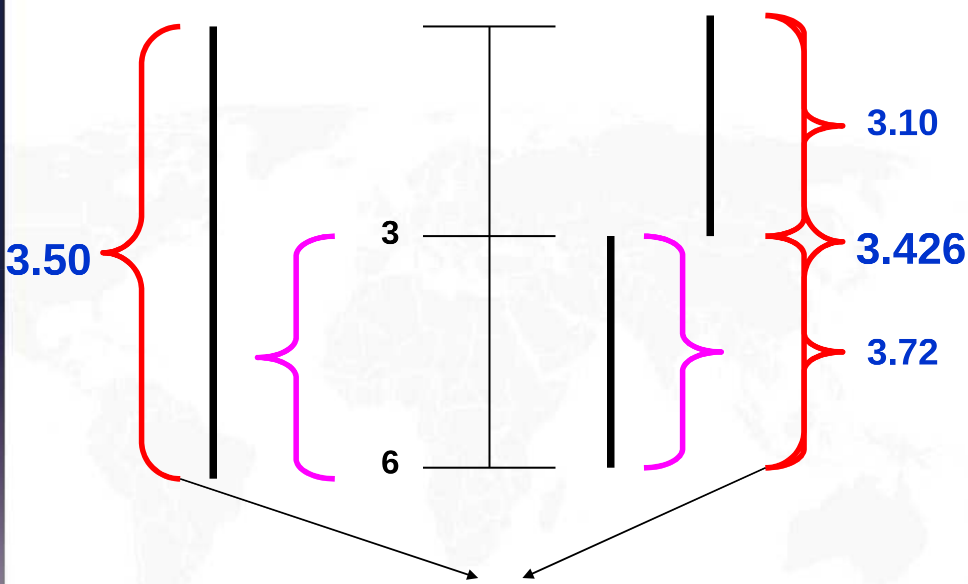
Interest rate risk : short at 3,50
- Capital

Interest rate risk : long at 3,10 ???
+ Capital

+10,000,000 deposit 3 MTH

WHAT CAN WE DO ?

Use of FRA : ARBITRAGE



Profit 7.4 pts

Use of FRA : ARBITRAGE

- Reverse the cash deals : no profit, double credit line utilization
-
- It appears that the 3/6 FRA quotations 3.68-72 %.

- Using the FWD/FWD formula, we have a short position in the 3/6 cash at a rate of : 3.865%

ARBITRAGE OPPORTUNITY !!!

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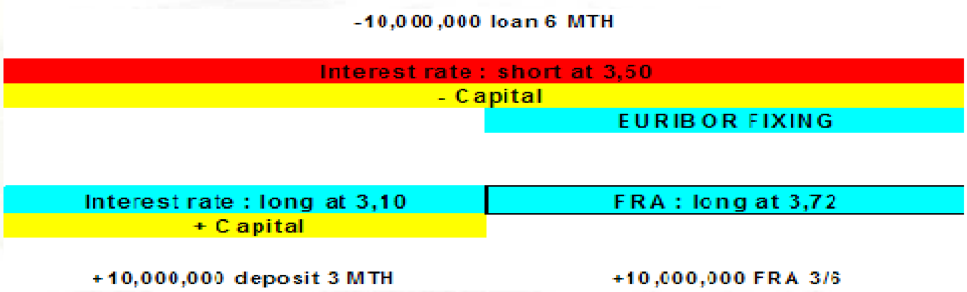
Use of FRA : ARBITRAGE

The bank buys a 3/6 at 3.72 :



The FRA will be fixed at EURIBOR :

so, when we buy a 3/6 FRA, we create a position against the EURIBOR !!!

Use of FRA : ARBITRAGE

Compounding the interest of the position, we have covered our six month exposure at a price of :

6 Month = (((1 + (3,1 * (91/3600))) * (1 + (3,72 * (92/36000)))) – 1) * (36000 / 183)

6 Month = 3.426 %

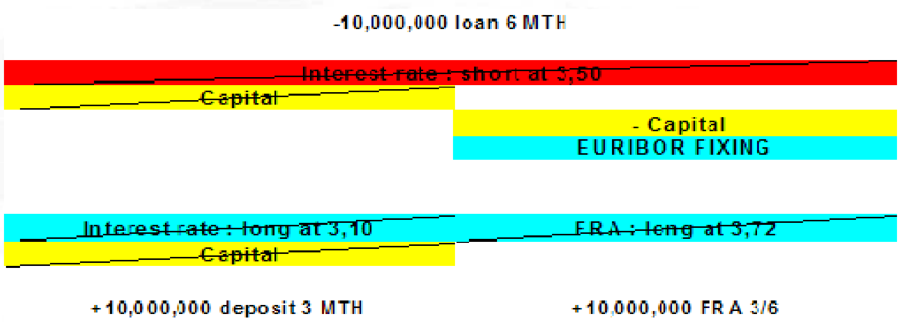
Bank profit is :

((3,50 – 3,426) * 183 /36000) * 10.000.000 =

3.761,67 euros

Use of FRA : ARBITRAGE

The resulting position is now



Fixing date : the banks has to borrow 10 Mio Euros in cash to cover its cash position

⇒ **the bank is short in cash at the EURIBOR fixing**

Use of FRA : ARBITRAGE

Euribor : top of the market (offer side)

- 3 possibilities :

• If the bank is able to fund itself at the EURIBOR, there is no additional profit

• If the bank can only borrow at EURIBOR + x BPs : the profit of the arbitrage decreases

• If the bank can borrow under the EURIBOR, we will have an additional profit

- The name of the bank has an impact on the profit from the arbitrage : if the bank (small name) can only borrow at the top of the market plus a few basis points, it has to be taken in consideration while thinking about the arbitrage

Use of FRA : ARBITRAGE

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CHAP 4
Fwd/Fwd, FRA, Fut, Swaps

Forward/Forward I R

FRA
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- We took the example of an arbitrage when we finally are short at the EURIBOR (short in cash

- ⇒ long in FRA ⇒ short at EURIBOR)

- The other case is to cover a long cash position while selling an FRA

- Need to be cautious : at the fixing, we will be long in cash but at the EURIBOR rate : it will be hard to invest this cash at the offer side of the market

- This has to be taken into account while making the arbitrage

Conclusion

ADVANTAGES

- Savings of the interbank credit lines (Future = 0, FRA = 3 – 5%)
- Small use of Cash
- Arbitrages

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PITFALLS

- The leverage effect : a potential danger
- Future markets volatility : a real threat
- Front and back-offices software tools for risk evaluation

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FRA / FORWARD FORWARD CASH
THE KEY DIFFERENCES

	FWD/FWD CASH	FRA
Cash flows	Capital + interests	Interest rate differential in cash only on the forward date
Balance sheet	Yes	Off balance sheet
Credit risk	Full exposure	small utilisation of credit limits
Liquidity	Small	High
Price discrimination	High	Small

IV 4

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Money Market Futures : Short Term Interest Rate (S.T.I.R) Futures

Money Market (STIR) Futures

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Presentation

- Futures trade on **organized exchanges** (EURONEXT, SYMEX, CME…)
- Futures exchanges : Clearinghouses and the **disappearance of credit risk**
- Futures trading : margin payments and daily settlement
- Liquidity and delivery
- Trading can be done on the floor (“pit”) or through electronic channels (like GLOBEX for the CME)

(for the Certificate, we will only focus on short term interest rates futures and not on other futures like bonds futures, futures on options or commodities)

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Organised Exchange

- The organized exchange is **ruled by the Clearinghouse**
- Clearinghouses guarantees the fulfillment of the contracts to parties
- Clearinghouses are large and very well capitalized organisations
- Clearinghouses have never faced bankruptcy : with futures, the credit risk disappears (we will see later how the Clearinghouse protects itself against this risk)

Organised Exchange

- With FRAs, two organizations trade together
- With futures, organizations trade with the Clearinghouse
- In fact, organizations will trade with clearing members (a clearing member is a member of the Exchange who is also member of the Clearinghouse)
- Clearing members then trades with the Clearinghouse (The Clearinghouse only trades with clearing members)

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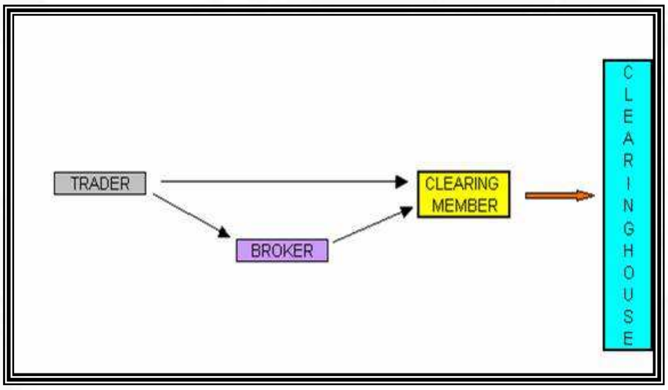
The possibilities for trading are then :



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Organised Exchange

STANDARDIZED TERMS

The terms of future contracts are standard :

- Quantity
- Expiration month
- Delivery dates
- Minimum price fluctuation
- Daily price limit
- Trading days and hours

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Contracts Specifications

CONTRACTS SPECIFICATIONS IN SOME EXCHANGES

Contract	EURO USD 3 MTH	EURO 3 MTH	STERLING 3 MTH	EURO CHF 3 MTH	EURO JPY 3 MTH
Exchange	Euronext - LIFFE				CME
Unit of Trading	1.000.000	1.000.000	**500.000**	1.000.000	**100.000.000**
Basis point Value	25	25	**12,5**	25	2.500
Min. Price Movement	1/2 Basis Point	1/2 Basis Point	**1 Basis Point**	**1 Basis Point**	1/2 Basis Point
Quotation	100 - Interest Rate				
Fixing	Libor	**Euribor**	Libor	Libor	Libor
Min. EDSP increment	0,001%				
Settlement	Cash				
Last Trading Day	2 business days prior the 3rd Wednesday of the delivery month	2 business days prior the 3rd Wednesday of the delivery month	**The 3rd Wednesday of the delivery month**	2 business days prior the 3rd Wednesday of the delivery month	2 business days prior the 3rd Wednesday of the delivery month

The list above is obviously not complete :
we have Euro CHF contracts in the CME,
Euro JPY contract listed in the
Euronext – LIFFE …

Contracts Specifications

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A few points to notice on the previous board :

- The fixing of the futures are based on LIBOR or EURIBOR : so, futures are offered rates
- The basis point value gives us a very important information : the short term interest futures are always calculated on a 360/360 basis (even for GBP)

Taking the example of the 3 month Eurodollar contract :

1 Basis Point in USD value = 1.000.000 * 0.01 * 90 /36000
= 1.000.000 * 0.01% * 3/12 = 25 USD

Taking the example of the 1 month Eurodollar contract :

1 Basis Point in USD value = 1.000.000 * 0.01 * 30 /36000
= 1.000.000 * 0.01% * 1/12 = 8.33 USD

Contracts Specifications

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- Another very important point is the quotation : 100 – interest rate
- The quotation for a rate of 3.22 %
  = 100 – 3.22 = 96.78

Danger :

- If you anticipate a rise in rates, you sell futures (*while you would buy FRAs*)
- If you anticipate a fall in rates, you buy futures (*while you would sell FRAs*)

Contracts Specifications

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- The STIRs futures are settled in cash according to the EDSP (Exchange Delivery Settlement Price) : so against LIBOR, EURIBOR, TIBOR… depending on the contract and the Exchange
- So, in our contracts specification, a minimum EDSP price increment of 0.001% means that the fixing taken into consideration will be with three digits after the point.
- To respect that, fixings are rounded : **a LIBOR fixing of 3.85243 will be rounded to 3.852 (this rate will become the fixing of the STIR contract)**

Initial Deposit and Margins

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Clearinghouses are funded through 2 channels

- The price paid by members to have a “seat” in the Exchange (to become a member of an Exchange has a cost that vary according to the Exchange and this cost can be up to several hundred thousands USD)
- The initial deposit and margin system

Initial Deposit and Margins

- To have the right to trade futures in an Exchange, a trader must pay an initial deposit (initial margin)
- This is a safeguard to ensure that everybody will fulfill the Exchange requirements
- The initial deposit can be made in cash or in securities
- This deposit is approximately equal to the maximum daily price fluctuation for a contract
- And so, the Exchange may change the initial margin requirement for a contract (higher volatility may lead to higher margin)

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Initial Deposit and Margins

- The initial deposit has to be paid to a clearing member
- The clearing member will then make a deposit to the clearing house
- The deposit vary from contract to contract and even from broker to broker
- After having completed all its obligations with the clearing member, the initial deposit is returned to the trader

Initial Deposit and Margins

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- The second type of margin is the maintenance margin
- The maintenance margin is the minimum level of deposit under which the trader's account should not fall under
- Compared to the initial margin, it is usually around 75% of it but vary from contract to contract and to broker to broker
- For example, in may 2006,
  - the initial deposit on the 3 Month Eurodollar contract of the CME was **945 $ / contract** and
  - the maintenance margin was of **700 $**

Initial Deposit and Margins

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- When the trader's account is under the maintenance margin, we have a variation margin (a "margin call")
- The variation margin is another safeguard
- The variation margin brings back the trader's account to the amount of the initial deposit
- The variation margin is always paid in cash
- The margin call is made on a daily basis or even during the day if the maximum price fluctuation has been reached (as for example +/- 25 bps on 3 Mths Euribor)

Initial Deposit and Margins

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- Failing to pay the margin call implies an automatic closing of the account by the clearing member

- On the other side, the trader, thanks to its favorable positions, who has an account in excess of the initial deposit can withdraw cash from his account

- Thanks to this system of margins, hedging with futures may have an additional cost (if need to fund the margin call) or an additional profit (while investing the proceeds of positive margins)

Initial Deposit and Margins

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Example of margins variations :
purchase of 10 Eurodollar contracts at 95.00

Day	Contract price	Profit / Loss	Beginning Margin	Cash withdrawal	Margin call	Margin account
1	95,00	0	0	0	9.450	(1) 9.450
2	94,98	- 500	9.450	0	0	(2) 8.950
3	94,83	- 3.750	8.950	0	4.250	9.450
4	94,78	- 1.250	9.450	0	0	(3) 8.200
5	94,98	5.000	8.200	3.750	0	9.450
6	95,10	3.000	9.450	12.450	0	0
RESULT	10	2.500		16.200	13.700	

INITIAL MARGIN : 9,450 $

MAINTENANCE MARGIN : 7,000 $

(comments on the next slide)

Initial Deposit and Margins

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Explanations :

(1) : we lost 500 $ on the position (25 $ * 10 contracts * 2 BPs) but our account is still above the maintenance margin of 7.000 $ (8.950 $ versus 9.450 $)

(2) : we lost 3.750 $ on the position and so we face a margin call that will bring our account back to the amount of the initial deposit :

8.950 – 3.750 – 9.450 = 4.250 $ ⇒ 8.950 + 4.250 – 3.750 = 9.450 $

(3) : we won 5.000 $ but our margin account is under the initial deposit for 1.250 $ so we can only withdraw 3.750 $ because we have to set our margin account at the level of the initial deposit :

8.200 + 5.000 – 9.450 = 3.750 $

FRA Yield Curve via the Futures

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Remember :

Construction of the full yield curve from market data

Chap. 1
Curve Notion

Typical inputs to the money market curve

Type	Settlement date	Rate (%)
Cash	Overnight rate	5.58675
Cash	Tomorrow next rate	5.59375
Cash	1m	5.625
Cash	3m	5.71875
Future	Dec-97	94.24
Future	Mar-98	94.23
Future	Jun-98	94.18
Future	Sep-98	94.12
Future	Dec-98	94.00
Swap	2y	6.01253
Swap	3y	6.10823
Swap	4y	6.16
Swap	5y	6.22
Swap	7y	6.32
Swap	10y	6.42
Swap	15y	6.56
Swap	20y	6.56
Swap	30y	6.56

A list of standard instruments used to build a money market yield curve.

The data is for lending in US dollar, taken from 6 October 1997

FRA Yield Curve via the Futures

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Using the previous data, we can build up a zero coupon yield curve

(for instance offer side of the quotation)

and subsequently calculate the different forward/forward.

We call that construction the "stripping" (*)of the curve.

(*) STRIPS = Separately Traded Interest and Principal Securities

FRA Yield Curve via the Futures

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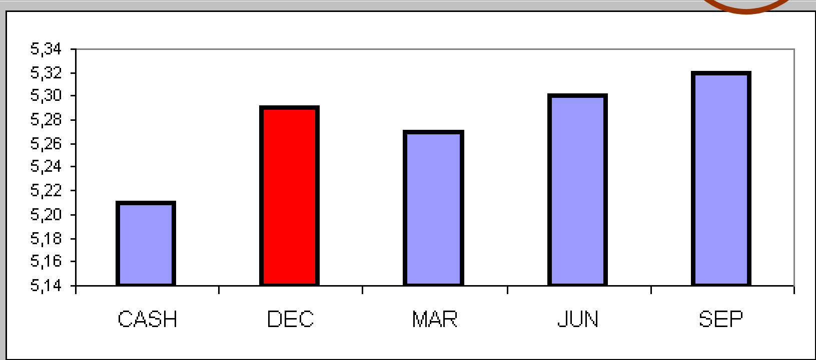
Value the 24th of October

				PER	FUT	RATE	ZC RATE
24/10/2006	20/12/2006	57	57	CASH		5,21	5,210
20/12/2006	21/03/2007	91	148	DEC	94,71	5,29	5,286
21/03/2007	20/06/2007	91	239	MAR	94,73	5,27	5,324
20/06/2007	19/09/2007	91	330	JUN	94,70	5,30	5,369
19/09/2007	19/12/2007	91	421	SEP	94,68	5,32	5,415



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FRA Yield Curve via the Futures

ZC CURVE

20/12/2006	57	5,210
21/03/2007	148	5,286
20/06/2007	239	5,324
19/09/2007	330	5,369
19/12/2007	421	5,415

Linear interpolation

Fixed Maturities :	Maturity dates	Nb Days	Rate Before	Rate After	Days ZC Before	Days ZC After	Days From last to Fixed Date	Days ZC Period	Date Ratio	Difference Rate Bef & After	STRIP
spot	25/10/2006										
3M	25/01/2007	92	5,21	5,29	57	148	35	91	0,385	0,08	**5,2392**
6M	25/04/2007	182	5,286	5,32	148	239	34	91	0,374	0,04	**5,3**
9M	25/07/2007	273	5,3235	5,37	239	330	34	91	0,374	0,05	**5,3404**
12M	25/10/2007	365	5,3687	5,41	330	421	35	91	0,385	0,05	**5,3864**

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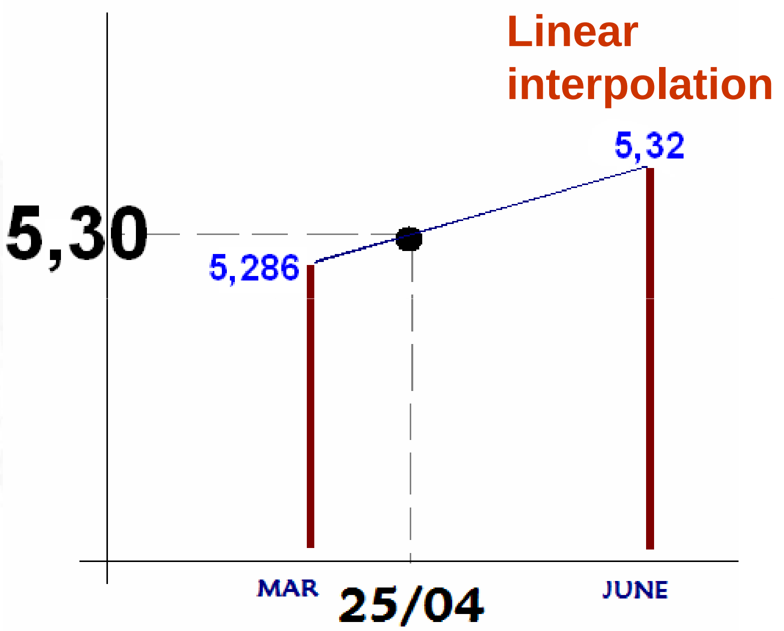

6M	25/04/2007	182	5,286	5,32	148	239	34	91	0,374	0,04	5,3

FRA Yield Curve via the Futures

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	days	strip
25/10/2006		
20/12/2006	57	5,210
25/01/2007	**92**	**5,239**
21/03/2007	148	5,286
25/04/2007	**182**	**5,300**
20/06/2007	239	5,324
25/07/2007	**273**	**5,340**
19/09/2007	330	5,369
25/10/2007	**365**	**5,386**
19/12/2007	421	5,415

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FRA Yield Curve via the Futures

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FRA RATE=((((1+((LGR*LGD)/36000))/(1+((SHR*SHD)/36000)))-1)*36000/(LD-SD))

3/6 ⟹	3	25/01/2007	92	5,23924	
	6	25/04/2007	182	5,30003	**5,291**
6/9 ⟹	6	25/04/2007	182	5,30003	
	9	25/07/2007	273	5,3404	**5,28**
9/12 ⟹	9	25/07/2007	273	5,3404	
	12	25/10/2007	365	5,38641	**5,308**
3/9 ⟹	3	25/01/2007	92	5,23924	
	9	25/07/2007	273	5,3404	**5,321**
6/12 ⟹	6	25/04/2007	182	5,30003	
	12	25/10/2007	365	5,38641	**5,33**
3/12 ⟹	3	25/01/2007	92	5,23924	
	12	25/10/2007	365	5,38641	**5,364**

FRA Yield Curve via the Futures

Careful

This method doesn't take into account

- the local deformation of the yield curve
  (ex. : Turn of year) and

- the global shape of the curve (linear instead of curvilinear)

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FRA Yield Curve via the Futures

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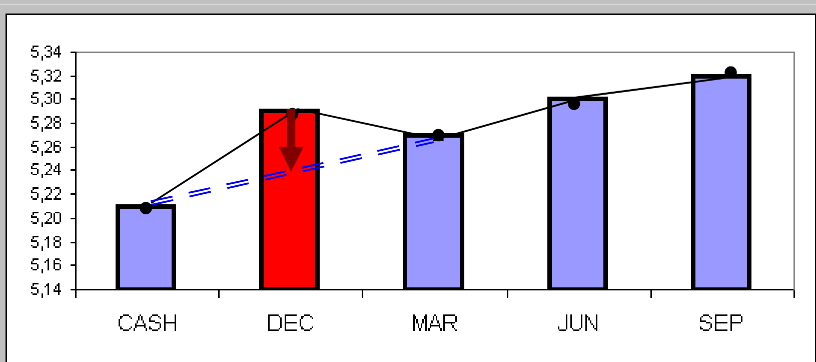
19/09/2007	19/12/2007	91	421	SEP	94,68	5,32	5,415



FRA building the Zero Coupon Curve

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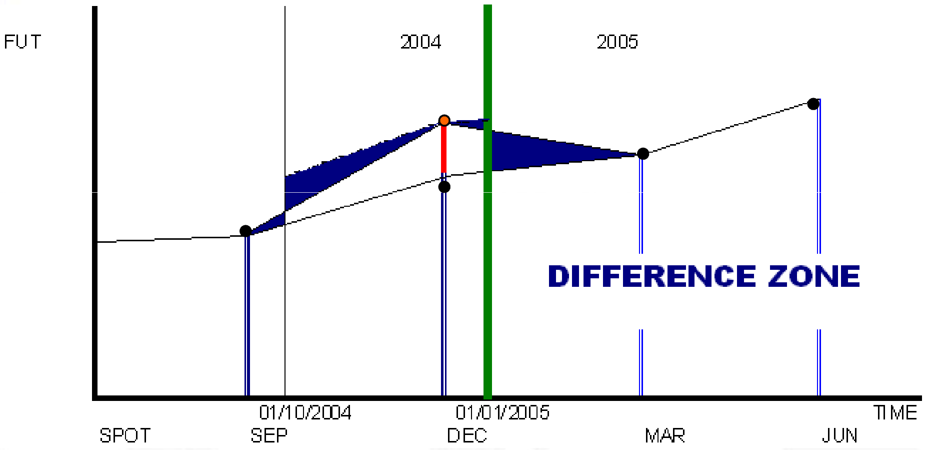
Turn Of the Year Effect



JUST FOR INFO

FRA building the Zero Coupon Curve

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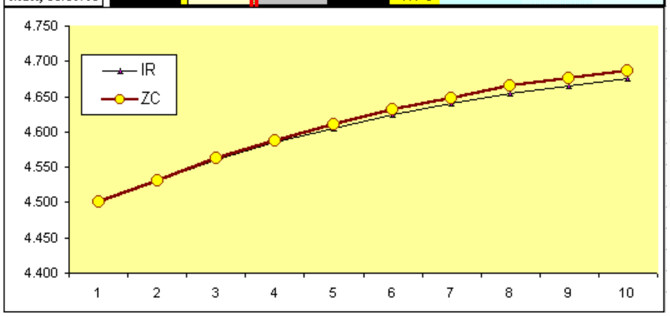
A-BOND-360 Date 03/07/03 Value 07/07/03

POSITIVE YIELD CURVE Doumart Software S.A. Luxembourg

	PER	IR	ZCR	FWD-FWD		IRS semi	IRS quart	RS An Euro
Wed, 07/07/04	1	4.500	4.500	0 / 1	4.50	4.450	4.426	4.44
Thu, 07/07/05	2	4.530	4.531	1 / 2	4.56	4.480	4.455	4.47
Fri, 07/07/06	3	4.560	4.562	2 / 3	4.62	4.509	4.484	4.50
Mon, 09/07/07	4	4.585	4.588	3 / 4	4.67	4.534	4.508	4.52
Mon, 07/07/08	5	4.605	4.609	4 / 5	4.69	4.553	4.528	4.54
Tue, 07/07/09	6	4.625	4.631	5 / 6	4.74	4.573	4.547	4.56
Wed, 07/07/10	7	4.640	4.648	6 / 7	4.75	4.587	4.561	4.58
Thu, 07/07/11	8	4.655	4.664	7 / 8	4.78	4.602	4.576	4.59
Mon, 09/07/12	9	4.665	4.675	8 / 9	4.76	4.612	4.586	4.60
Mon, 08/07/13	10	4.675	4.687	9 / 10	4.79	4.622	4.595	4.61



FRA building the Zero Coupon Curve

Via the Fwd/Fwd Rates **(or combination of a FRA deal and a Cash trade at Libor)**

We can accumulate the flows to the maturity date (for example 3 years) like :

$$IK * \left(1 + \frac{1Yir}{100}\right) * \left(1 + \frac{FRA\ 1/2}{100}\right) * \left(1 + \frac{FRA\ 2/3}{100}\right)$$

CHAP 4
Fwd/Fwd, FRA, Fut, Swaps

Forward/Forward I R

FRA

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FRA building the Zero Coupon Curve

And this accumulated amount must be equal to the accumulation via the Zero Coupon Rate (on APR display) :

$$IK * \left(1 + \frac{ZC3Y}{100}\right) * \left(1 + \frac{ZC3Y}{100}\right) * \left(1 + \frac{ZC3Y}{100}\right)$$

$$= IK * \left(1 + \frac{ZC3Y}{100}\right)^{3}$$

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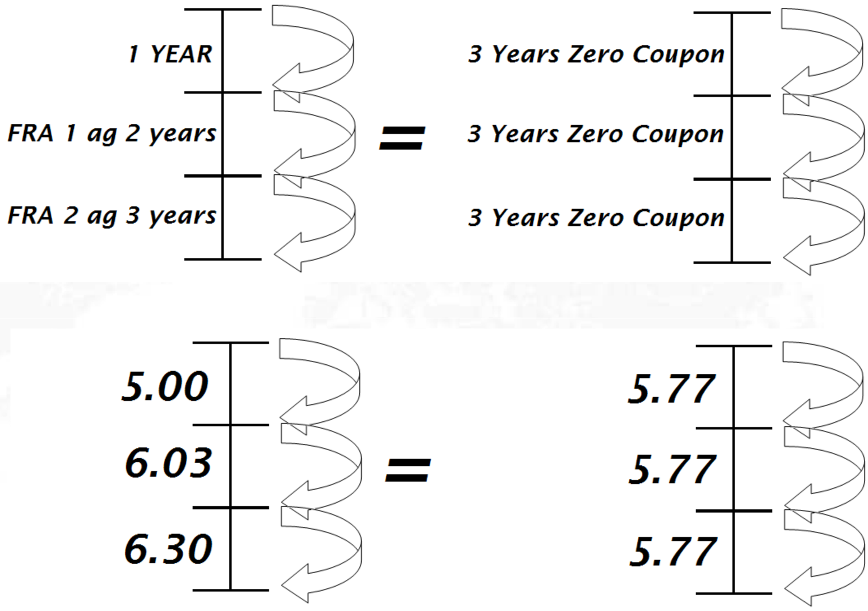

5,77 is the geometric average of 5,00 6,03 and 6,30

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FRA building the Zero Coupon Curve

Mid price IRS	
1	5,00
2	5,50
3	5,75

-100,00	100,00	SPOT	0,00
5,50	-105,00	1 Y	-99,50
105,50		2Y	**105,50**

105,5 = 99 x (1 + RATE 1against2 Y / 100)

so RATE 1against2 Y / 100 = ((105,5 / 99,5) - 1) x 100

so RATE 1 against 2 Y / 100 = 6,03

FRA building the Zero Coupon Curve

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PER	IRS theor	ZCOUP	FWDFWD		IRS semi	IRS quart	IRS An Euro
1	5,00	5,00	0 / 1	5,00	4,939	4,909	4,93
2	5,50	5,51	1 / 2	6,03	5,426	5,390	5,42
3	5,75	5,77	2 / 3	6,30	5,670	5,630	5,67
4	6,00	6,04	3 / 4	6,85	5,913	5,870	5,92
5	6,10	6,15	4 / 5	6,57	6,010	5,965	6,02

-100		100,00	SPOT		0,00	
5,75	→	-5,50	1 Y	→	0,25	6,03
5,75		-105,50	2Y	-99,48	-99,75	0,2651
105,75			2Y	105,75		

105,75 = 99,48 x (1 + RATE 2against3 Y / 100)
so RATE 2against3 Y / 100 = ((105,75 / 99,48) - 1) x 100
so RATE 2 against 3 Y / 100 = 6,30

1 Y	5,00	1 zc	5,00	= rate 1 year
1 ag 2 Y	6	2 zc	5,51382	=((((1+(Rate 1 year/100))*(1+(Rate 1 against 2 Years/100)))^(1/2))-1)*100
2 ag 3 Y	6,3	3 zc	5,77441	=((((1+(Zero rate 2 years/100))^2*(1+(2 against 3 Years/100)))^(1/3))-1)*10(

FRA building the Zero Coupon Curve

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Fwd/Fwd, FRA, Fut, Swaps

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TODAY 15/10/06
VALUE 17/10/06

Maturities	Year	IRS Bd B	FWD / FWD		ZCOUP	IRS semi	IRS quart	IRS An Euro
17/10/07	1	5,00	0 / 1	5,0	5,000	4,939	4,909	4,932
17/10/08	2	5,50	1 / 2	6,0	5,514	5,426	5,390	5,425
19/10/09	3	5,75	2 / 3	6,3	5,774	5,670	5,630	5,671
18/10/10	4	6,00	3 / 4	6,9	6,043	5,913	5,870	5,918

FACT actualisation
0,95238
0,89822
0,84500
0,79082

Zero Coupon	1Y							0 / 1		5,000 1YZC	**5,000**
Zero Coupon	2Y	flows	1Y	1,050	-0,055	**0,995**					
		flows	2Y		1,055	**1,055**		1 / 2		6,030 2YZC	**5,514**
Zero Coupon	3Y	flows	1Y	0,055	-0,058	**-0,003**					
		flows	2Y	1,055	-0,058	**0,998**	-0,0027		0,99485		
			3Y		1,058	**1,058**		2 / 3		6,298 3YZC	**5,774**
Zero Coupon	4Y	flows	1Y	0,058	-0,060	**-0,003**					
		flows	2Y	0,058	-0,060	**-0,003**	-0,0027		-0,005		
			3Y	1,058	-0,060	**0,998**	-0,0055		0,992		
			4Y		1,060	**1,060**		3 / 4		6,852 4YZC	**6,043**

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FRA building the Zero Coupon Curve

Another Method (easier):

As we know that the nominal amount is equal to the actualisation of all the future flows, we can proceed that way to calculate the ZCR

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Fwd/Fwd, FRA, Fut, Swaps

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FRA building the Zero Coupon Curve

$$1 = \sum_{t=1}^{n-1} \frac{IR\ t}{(1+zr\ t)^{t}} + \frac{1+IR\ n}{(1+zr\ n)^{n}}$$

where :

IR t = Interest Rate at the time t

Zr t = Zero Coupon rate at the time t

FRA building the Zero Coupon Curve

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$$ZC\ n = \left\{ \frac{1+IR\ n}{1-\sum_{t=1}^{n-1} \frac{IR\ t}{(1+zr\ t)^{t}}} \right\}^{1/n} - 1$$

FRA building the Zero Coupon Curve

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Swaps

TODAY	21/11/2007			
Value	23/11/2007			

	PER	IRS theor	ZCOUP	FWDFWD	
Mon, 24/11/08	1	4,00	4,00	0 / 1	4,00
Mon, 23/11/09	2	4,10	4,10	1 / 2	4,20
Tue, 23/11/10	3	4,20	4,21	2 / 3	4,41
Wed, 23/11/11	4	4,30	4,31	3 / 4	4,63
Fri, 23/11/12	5	4,40	4,42	4 / 5	4,85
Mon, 25/11/13	6	4,50	$\boxed{4,53}$	5 / 6	5,08
Mon, 24/11/14	7	4,60	4,64	6 / 7	5,31
Mon, 23/11/15	8	4,70	4,75	7 / 8	5,56
Wed, 23/11/16	9	4,80	4,87	8 / 9	5,81
Thu, 23/11/17	10	4,90	4,99	9 / 10	6,08

Let's check :

exemple 6 years for a K of 1,000,000

	flow	act factor	actualized amt
after 1 y	45.000	4,00	43.269,23
after 2 y	45.000	4,10	41.523,50
after 3 y	45.000	4,21	39.768,43
after 4 y	45.000	4,31	38.009,46
after 5 y	45.000	4,42	36.251,81
after 6 y	1.045.000	4,53	801.177,56
		sum =	1.000.000,00

$$\sum_{t=1}^{n-1} \frac{IR_t}{(1+zr\ t)^{t}}$$

$$\frac{1+IR\ n}{(1+zr\ n)^{n}}$$

FRA building the Zero Coupon Curve

IR can be the rate used for PV calc for an global Investment, never for single flows!

PER	IRS theor	ZCOUP	FWD	0
1	4,00	4,00	0 / 1	4,00
2	6,00	6,06	1 / 2	8,16
3	7,00	7,12	2 / 3	9,27
4	7,80	8,01	3 / 4	10,70
5	8,40	8,69	4 / 5	11,49
6	8,80	9,16	5 / 6	11,55

$$\frac{88.000}{\left(1+\frac{4,00}{100}\right)^{1}} + \frac{88.000}{\left(1+\frac{6,06}{100}\right)^{2}} + \frac{88.000}{\left(1+\frac{7,12}{100}\right)^{3}} + \frac{88.000}{\left(1+\frac{8,01}{100}\right)^{4}} + \frac{88.000}{\left(1+\frac{8,69}{100}\right)^{5}} + \frac{1.088.000}{\left(1+\frac{9,16}{100}\right)^{6}} =$$

$$84.615,38 + 78.229,32 + 71.589,60 + 64.669,87 + 58.003,00 + 642.892,83 = \mathbf{1.000.000}$$

$$\frac{88.000}{\left(1+\frac{8,80}{100}\right)^{1}} + \frac{88.000}{\left(1+\frac{8,80}{100}\right)^{2}} + \frac{88.000}{\left(1+\frac{8,80}{100}\right)^{3}} + \frac{88.000}{\left(1+\frac{8,80}{100}\right)^{4}} + \frac{88.000}{\left(1+\frac{8,80}{100}\right)^{5}} + \frac{1.088.000}{\left(1+\frac{8,80}{100}\right)^{6}} =$$

$$80.882,35 + 68.327,57 + 68.327,57 + 62.801,08 + 57.721,58 + 655.927,02 = \mathbf{1.000.000}$$

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CHAP 4
Fwd/Fwd, FRA, Fut, Swaps

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FRA building the Zero Coupon Curve

Curve evolution (comparison ZCR and IRS calculated)

		TODAY	19/01/2010
		Value	21/01/2010
	PER	IRS theor	ZCOUP
	1	6,00	6,00
	2	6,80	6,83
	3	7,30	7,36
	4	7,80	7,91
	5	8,30	8,49
-0,06	5,08	8,341	8,54
-0,10	5,17	8,382	8,59
-0,13	5,25	8,424	8,64
-0,15	5,33	8,465	8,69
-0,17	5,42	8,507	8,74
-0,17	5,50	8,548	8,79
-0,16	5,58	8,590	8,84
-0,14	5,67	8,632	8,89
-0,12	5,75	8,674	8,94
-0,09	5,83	8,716	9,00
-0,05	5,92	8,758	9,05
	6	8,80	9,10

Use of FUTURES

As for FRAs, STIRs can be used for :

- Trading
- Hedging
- Arbitrages

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Use of FUTURES : TRADING

- We can play an evolution in interest rates (going short or long of futures)
- We can also play the curve

If we refer to the yield curve strategies with FRAs :

FRA		**FUTURE**
Buy the near FRA	↔	Sell the near Future
	Flattening of a positive yield curve	
Sell the far FRA	↔	Buy the far Future

FRA		**FUTURE**
Sell the near FRA	↔	Buy the near Future
	Steepening of a positive yield curve	
Buy the far FRA	↔	Sell the far Future

Use of FUTURES : HEDGING

- Futures are definitely a good tool for hedging
- The problem is that they are standardized contracts and have their own rules of functioning
- Therefore, it is harder to hedge some tools (like deposits) with futures than with FRAs
- Nevertheless, the particularities of future play in their favor (liquidity, anonymity, no credit risk…)
- We will see below that there are also some pitfalls in hedging even IMM FRAs with Futures

Use of FUTURES : HEDGING

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IMM FRA / FUTURE

Example : hedging a 3/6 IMM FRA with the corresponding future (dates are exactly the same)

Our position is the following one :

- In March 2011, we buy from a client a 3/6 FRA IMM (**JUN2011**) for USD 100.000.000 at 5 % (98 days)
- We hedge ourselves by buying 100 USD March contracts at 95 (⇒ 5 %)

EXCEPTIONAL CASE COMING FROM 15/06/2011 TO 21/09/2011 (Usually IMM periods are 91 Euro days)

Use of FUTURES : HEDGING

IMM FRA / FUTURE

For clarity purposes :

- We will assume no transaction costs
- We will assume that the initial deposit is equal to the maintenance margin (which may be the case with some brokers)
- We will assume that our broker doesn't pay us any money for our initial deposit (as it may be sometimes the case). The funding of our initial deposit is during 88 days at 4.60 %
- We will assume <ins>no margin</ins> calls or cash withdrawal

Use of FUTURES : HEDGING

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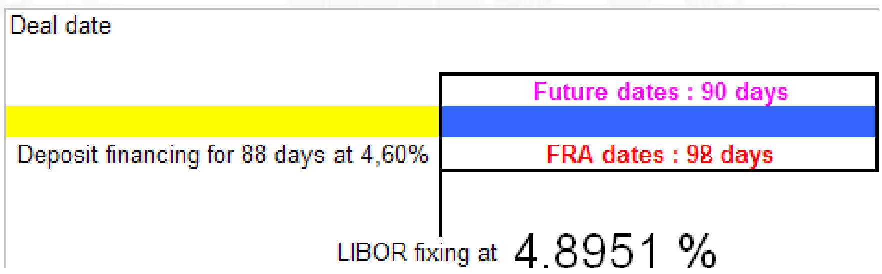
IMM FRA / FUTURE

We will also take the following values :

- The initial deposit is 945 $ * 100 contracts = 94.500 $
- The LIBOR fixing is 4.8951 %

The situation is :



Use of FUTURES : HEDGING

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IMM FRA / FUTURE

We then have :

- Cost of financing the initial deposit :

94.500 * 4.60 * 88 / 36000 = - 1.062,60 $

- The Future will have a fixing of 4.895 (LIBOR rounded at 0.001%). We earn 10.5 BPs (5 – 4.895) :

10.5 * 100 * 25 = + 26.250 $

- We lose in the FRA :

[((5 – 4.8951) * 98 * 100.000.000 / 36000)] / [(1 + ((4.8951 * 98) / 36000)]

- 28.180,59 $

Use of FUTURES : HEDGING

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IMM FRA / FUTURE

So, the final result is :

+ 26.250 - 28.180,59 - 1.062,60 = **-2.993,19 $**

As we can see our hedge is not perfect !!!

WHY ???

Use of FUTURES : HEDGING

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IMM FRA / FUTURE

Several reasons for that :

- The numbers of days of the FRA (exact / 360) is different from the number of days of the Future (90 / 360)
- The FRA is settled on a discounted basis, which is not the case for future

Taking that into account, we should adapt the number of future contracts to improve our hedge :

The result on the FRA will be :

100.000.000 * (LIBOR – 5) * (98/36000) / [(1 + ((LIBOR * 98) / 36000)]

The result on the Eurodollar Futures will be :

1.000.000 * number of contracts * (LIBOR – 5) * 90/36000

Use of FUTURES : HEDGING

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IMM FRA / FUTURE

- Obviously, when we enter the trade we won't know what will be the LIBOR : the best estimation for the LIBOR fixing is then the Future rate (so 5%)
- We have :

100.000.000 * **(LIBOR – 5)** * (98/36000) / [(1 + ((LIBOR * 98) / 36000)] = 1.000.000 * number of contracts * **(LIBOR – 5)** * 90/36000

⇒ 100.000.000 * (98/36000) / [(1 + ((5 * 98) / 36000)] = 1.000.000 * number of contracts * 90/36000

⇒ **number of contracts = 100 * (98 / 90) / [(1 + ((5 * 98) / 36000)]**

⇒ number of contracts = 107.42

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Use of FUTURES : HEDGING

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IMM FRA / FUTURE

- As we have to trade in a rounded amount, we will buy 107 contracts and not 100
- Only compared with the FRA fixing it improves our hedge :

	HEDGE 100 CONTRACTS	HEDGE 107 CONTRACTS
FUTURE	26 250,00	↗ 28 087,50
FRA	-28 180,59	-28 180,59
DELTA	-1 930,59	-93,09

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Use of FUTURES : HEDGING

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IMM FRA / FUTURE

The two other factors that impacts the result of our hedge are :

- the financing of the initial deposit and the margin calls
- the rounded number used for the EDSP (while the number is not rounded for the FRAs fixing)

But no hedge is perfect and we can say anyway this hedging still is a very good one

Use of FUTURES : HEDGING

THE BASIS RISK

- Another problem while hedging with a Future instrument is the basis risk

- The basis risk is the risk of a different evolution between an asset to hedge and the evolution of the Future price

- There is a risk attached to the evolution of the shape of the yield curve

Use of FUTURES : HEDGING

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THE BASIS RISK

Example : we hedge a 1/4 spot (short or long) with a 3/6 IMM Future (short or long)

	FRA	FUTURE	DELTA	
SPOT DATE	**3,05**	**3,15**	**0,10**	(1)
1) FIXING OF THE 1/4	**3,00**	**3,15**	**0,15**	(2)
2) FIXING OF THE 1/4	**3,00**	**3,07**	**0,07**	(3)

(1): on spot date, we have a 10 BPs difference between the 1/4 spot and the 3/6 IMM

(2): on the fixing date, the difference between the 3 month LIBOR and the 2/5 IMM is now of 15 BPs : the yield curve has steepened

(3): on the fixing date, the difference between the 3 month LIBOR and the 2/5 IMM is now only 7 BPs : the yield curve has flattened

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Use of FUTURES : ARBITRAGE

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- If the Future yield curve is different from other yield curves (FRAs, deposits, IRS…), there is an arbitrage situation between the different instruments

- But one's should always keep in mind the specificities of the Future market before to enter into any kind of arbitrage

- For example, it not as easy than with FRAs to arbitrage the cash market against futures (problem of interest calculations, mismatching in dates…)

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The Key Differences

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	STIRs Futures	FRA
Cash flows	Initial deposit Daily profit / loss	cash only on the forward date
Netting	yes : purchases and sales are offset	No netting, even in case of trading with the same counterpart
Credit risk	no credit risk (except if the clearing house goes bankruptcy !!!)	small utilisation of credit limits
Settlement dates, maturities, amounts	Standardized	Tailor made
Anonymity	Yes	No
Price discrimination	No	Yes
Administration	Complex	Less complex
Basis	30 / 360	Exact / Currency basis

Money Market Swaps

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Swaps
Presentation
Quotation
SMA
C(IR)S
OIS
EONIA
Arbitrage

Swaps

Presentation
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Plain Vanilla IRS

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Quotation
SMA
C(IR)S
OIS
EONIA
Arbitrage

An Interest Rate Swap is an agreement between two parties to exchange interest rate on :

- Determinate long/short periods
- Fixed/floating rates

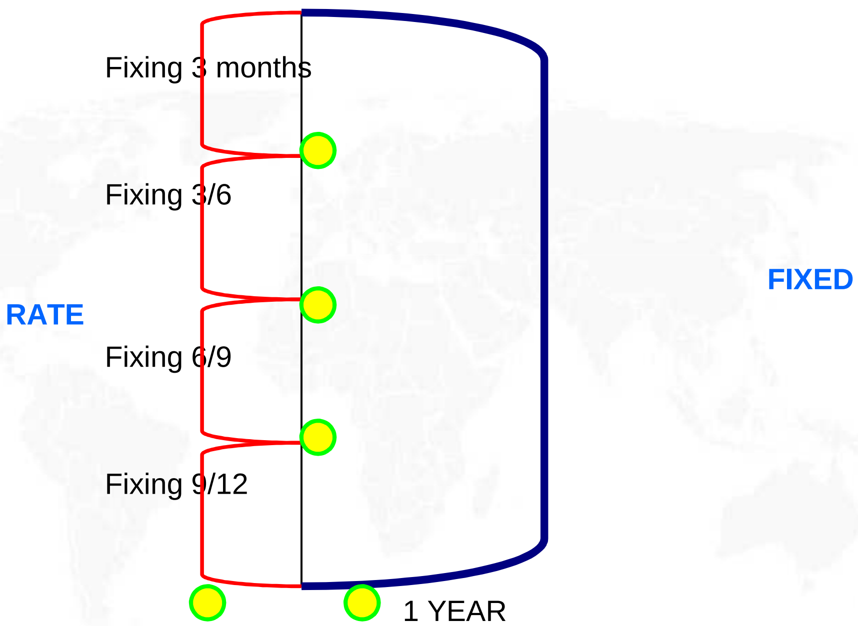
  within the same currency

Plain Vanilla IRS

Plain Vanilla IRS

CHAP 4
Fwd/Fwd, FRA, Fut, Swaps

Forward/Forward I R
FRA
MM Futures
Swaps
Presentation
Quotation
SMA
C(IR)S
OIS
EONIA
Arbitrage

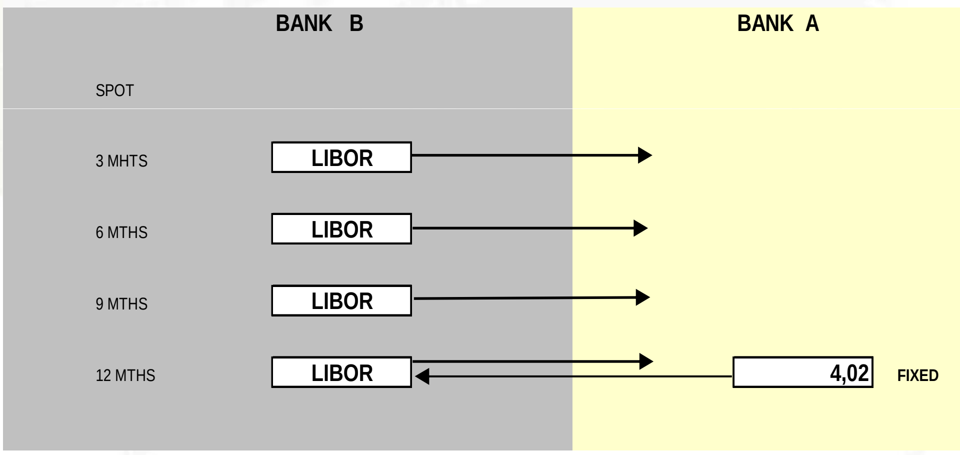


Example

Bank A borrows from bank B 100 mio 1 year fixed rate at 4.02 % and simultaneously lends to bank B the 3 months every 3 months during 1 year at the corresponding fixing rate.

No exchange of principal amount, just the interest amount transferred

Example



ATF LUXEMBOURG

Example

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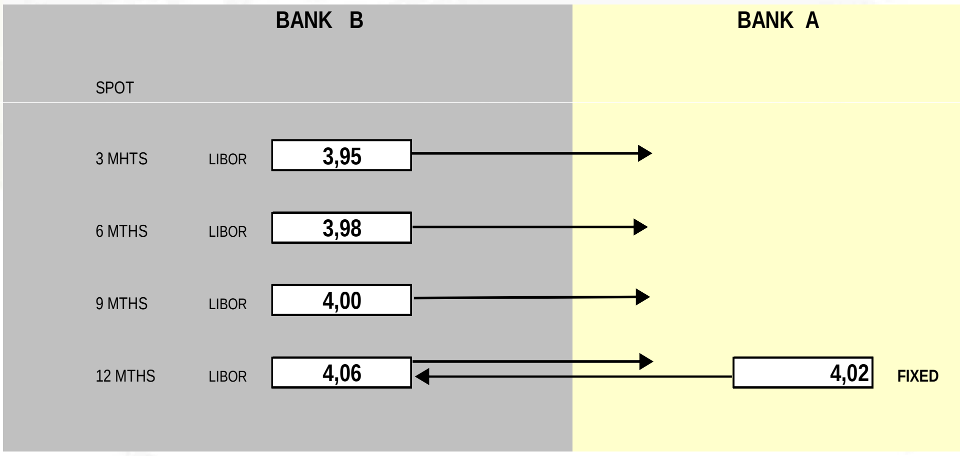

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Example

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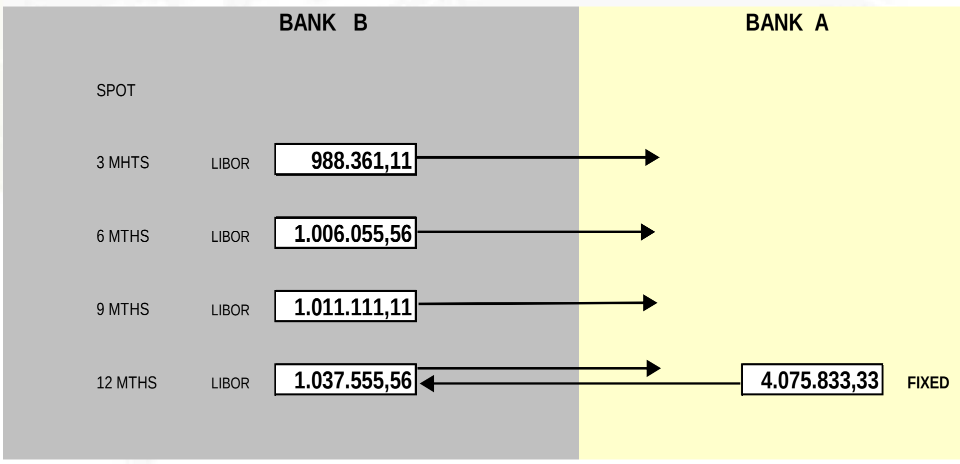

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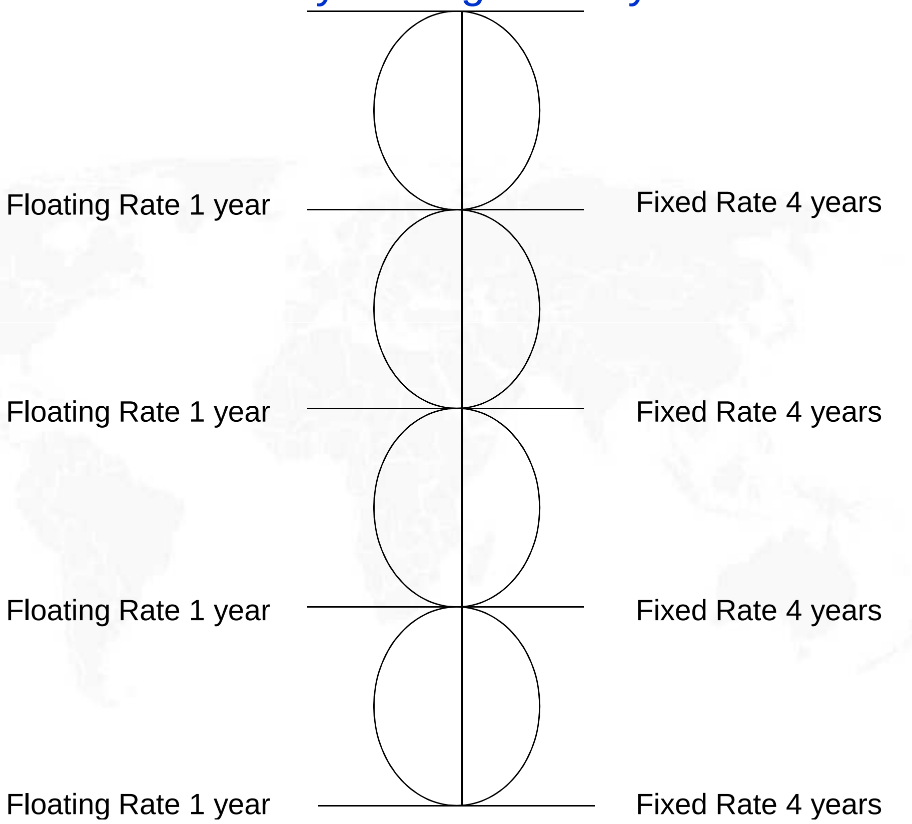
Long term IRS

Ex 4 years against 1 year



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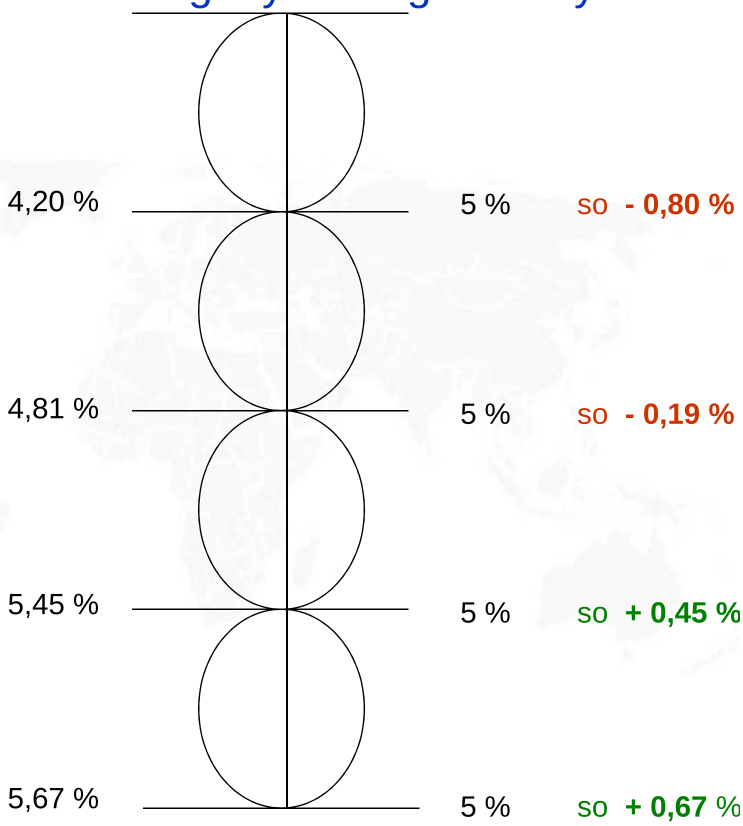
Long term IRS

Ex. : Taking 4 years against 1 year



Quotation

The PVS (Plain Vanilla Structure) IRS is quoted :

in long term Fixed Interest Rate,

the other leg (floating rates) being pure subsequent values according to the original agreement.

Quotation

The USD-denominated LT swap are priced off the corresponding US *Treasuries* as both ways dealing spread in basis points to be added to the mid-point of the appropriate period US Treasury bond

The GBP-denominated LT swap are based on the appropriate period UK *gilt prices* BUT usually already quoted as “all-in” rates on rates displays

The Swap Master Agreement

Under ISDA (International Swaps & Derivatives Association) terms and conditions defines :

- Terms & conditions of the swap
- Payment procedure
- Procedure for cancellation
- Applicable law
- Competent legal authority in the case of dispute

This is called the “ISDA Master Agreement”

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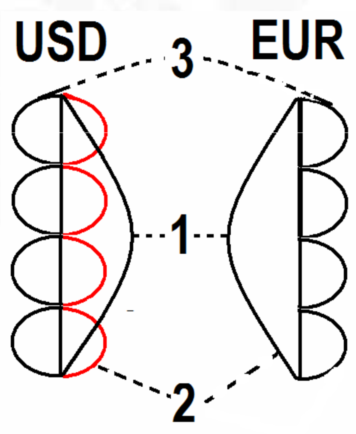
Currency (and Interest Rate) Swap

This IRS (named Currency Swap) is involving two different currencies.

The most common type is where one pays fixed in one currency and receives the floating in the other currency.

Exchange risk can be managed on pre-agreements

Currency (and Interest Rate) Swap



Can be made of :

Exchange of a fixed rate in one currency against a fixed rate in the other -1-

Exchange of a fixed rate in one currency against a floating rate in the other -2-

Exchange of a floating rate in one currency against a floating rate in the other -3-

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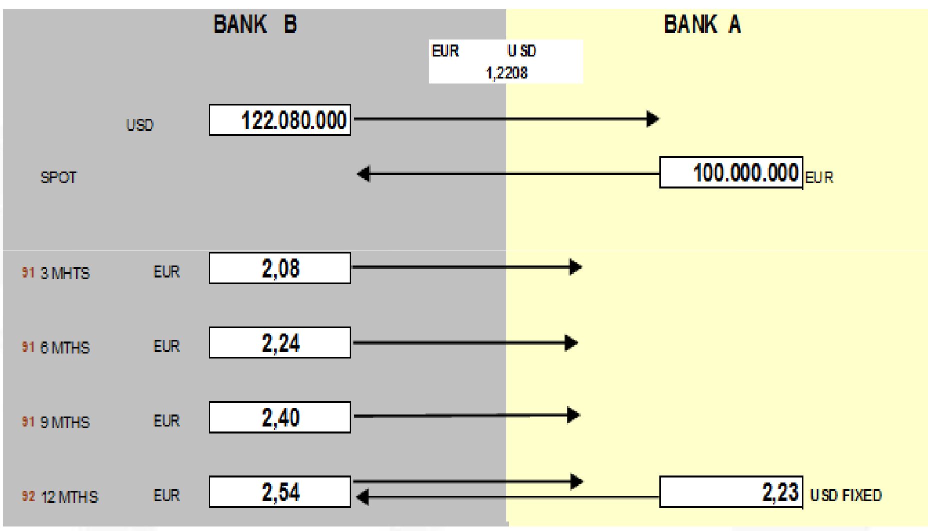
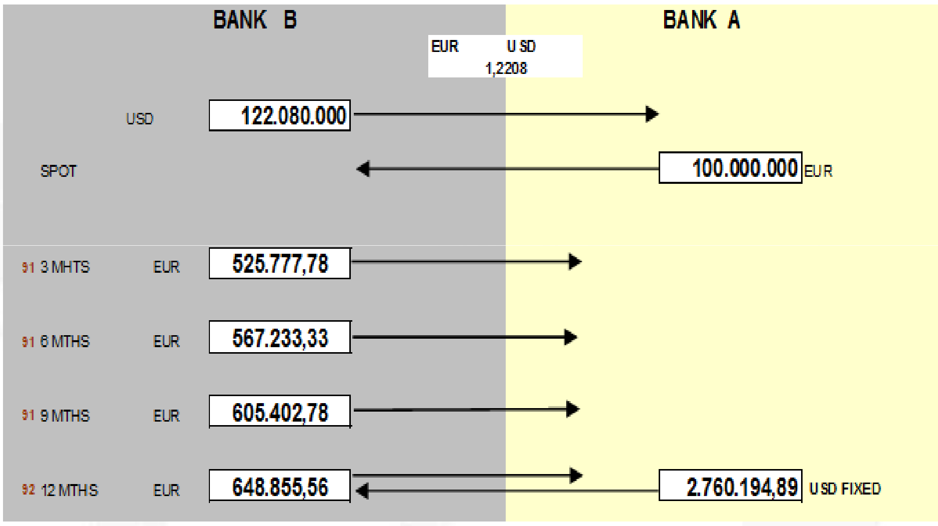
Example



The “locking” of the FX Forward is optional but recommended to avoid any unfavorable spot moves

Example



The exchange of principal is optional

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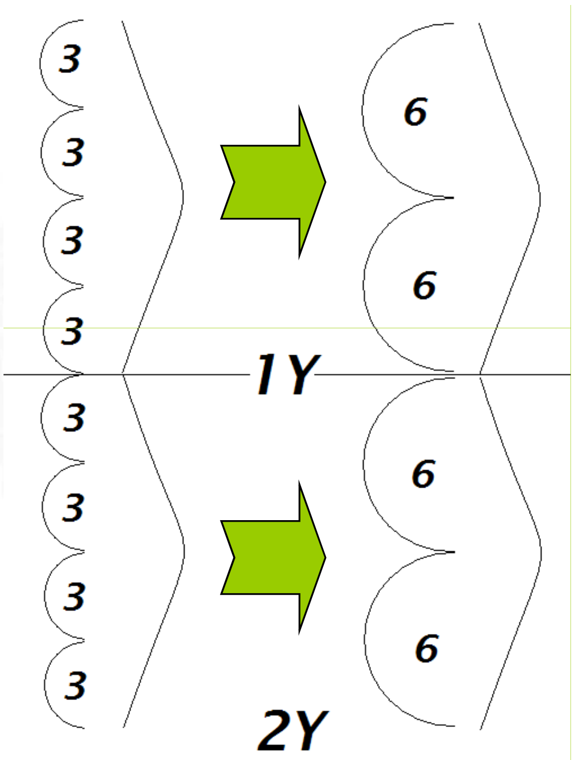
Basis Swap

1st type :

you want to transform an IRS 2 Years against 3 months to an IRS 2 Years against 6 months.

Solution :

the basis swap



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Forward/Forward I R

FRA

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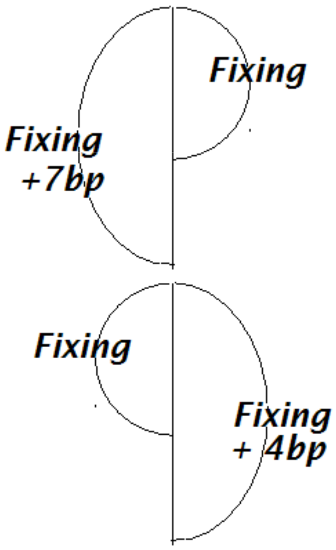
Basis Swap

A basis swap is the exchange of 2 floating rates within the same currency



Ex : On a quotation
3 years Basis Swap

3 -> 6 Mths at Fixing + 4/7 BP

which means that

to receive 3 Mths Fixing
we pay 6 Mths Fixing **+ 7 BP.**
to pay 3 Mths Fixing
we receive 6 Mths Fixing **+ 4 BP.**

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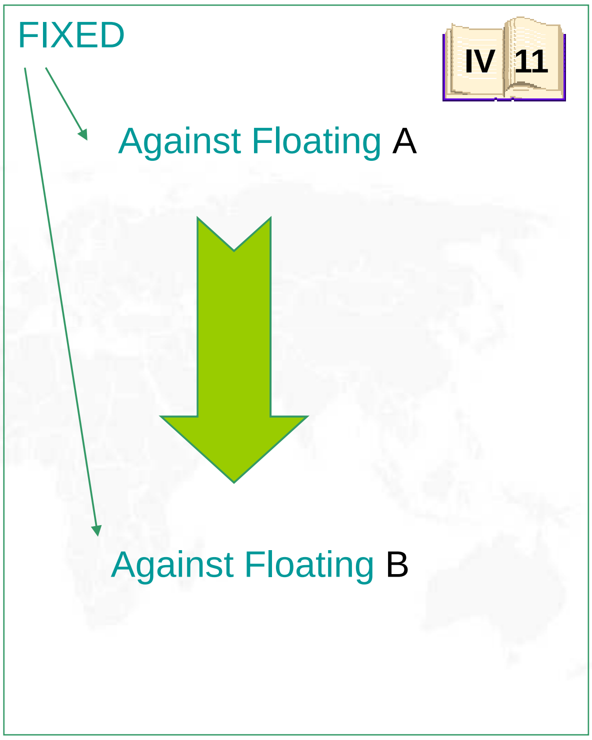
Basis Swap

2nd type :

you want to
transform
different risk
yield curves

Solution :

the basis swap



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Short swaps : The OIS

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Overnight Index Swap (OIS) is an interest rate swap involving the overnight rate being exchanged for some fixed interest rate.

Generally short-term, the interest of the overnight rate portion of the swap is compounded and **paid at maturity**.

For BO convenience, the actual settlement occurs one open day after the maturity of the OIS

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Short swaps : The OIS

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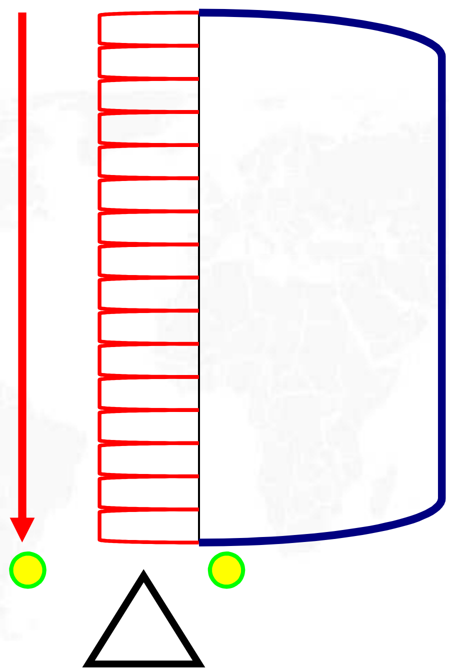

Short swaps : The EONIA

"EONIA Swap" (European Over Night Index Average) is an interest rate swap transaction, where one party agrees to receive/pay a fixed rate to another party, against paying/receiving a floating rate named EONIA.

"EONIA SWAP INDEX" is the average rate at which, at 16:30 Brussels time, a representative panel of prime banks provides daily quotes, rounded to 3 decimal places, that each Panel Bank believes is the mid market rate of EONIA SWAP quotations between prime banks.

It can be used in the euro-zone and worldwide. It is quoted on an actual / 360 day basis.

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The EONIA : EXAMPLE

Fixed rate of the EONIA 1 Month				2.11	500,908,472	
	Over Night			Euribor Fixing	Amount	
					500,000,000	
Mon	07/07/03	08/07/03	1	2.02	500,028,056	
Tue	08/07/03	09/07/03	1	2.02	500,056,113	
Wed	09/07/03	10/07/03	1	2.05	500,084,588	
Thu	10/07/03	11/07/03	1	2.03	500,112,787	
Fri	11/07/03	14/07/03	3	2.09	500,199,890	
Mon	14/07/03	15/07/03	1	2.11	500,229,208	
Tue	15/07/03	16/07/03	1	2.12	500,258,666	
Wed	16/07/03	17/07/03	1	2.20	500,289,237	
Thu	17/07/03	18/07/03	1	2.12	500,318,698	
Fri	18/07/03	21/07/03	3	2.14	500,407,922	difference
Mon	21/07/03	22/07/03	1	2.10	500,437,112	
Tue	22/07/03	23/07/03	1	2.03	500,465,331	8,543 EUR
Wed	23/07/03	24/07/03	1	2.02	500,493,413	1.98 PTS
Thu	24/07/03	25/07/03	1	2.02	500,521,496	
Fri	25/07/03	28/07/03	3	2.00	500,604,917	
Mon	28/07/03	29/07/03	1	2.02	500,633,006	
Tue	29/07/03	30/07/03	1	2.09	500,662,071	
Wed	30/07/03	31/07/03	1	2.13	500,691,693	
Thu	31/07/03	01/08/03	1	2.10	500,720,900	
Fri	01/08/03	04/08/03	3	2.15	500,810,613	
Mon	04/08/03	05/08/03	1	2.18	500,840,939	
Tue	05/08/03	06/08/03	1	2.14	500,870,712	
Wed	06/08/03	07/08/03	1	2.10	500,899,929	
			31	2.090158	500,899,929	

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Short swaps : The EONIA

CRITERIA TO QUALIFY FOR AND STAY ON THE EONIA SWAP INDEX PANEL

1. Banks can qualify for the panel (hereafter "panel banks") if they are active players in the Euro derivative markets in the euro-zone or worldwide and if they are able to handle good volumes in EONIA Swaps, even in turbulent market conditions.
2. Panel banks must be banks of first class credit standing, high ethical standards and enjoying an excellent reputation.
3. Banks wishing to apply for a seat on the panel must disclose all relevant information.
4. The information mentioned above will be treated by the EONIA Steering Committee (ESC) on a strictly confidential basis.

JUST FOR INFO

NUMBER OF PANEL BANKS

The number of panel banks will be both high enough to reflect faithfully the diversity of the EONIA SWAP market in the euro-zone and worldwide and low enough to ensure an efficient manageable panel consisting of prime banks only.

START-UP PANEL OF BANKS

The start-up panel of banks belonging to the same group can only provide a single quote. The Steering Committee (ESC) will ensure the strict application of this rule.

REVIEW OF THE PANEL

The list of the panel banks will be periodically reviewed by the Steering Committee (ESC) to ensure that the selected panel always truly reflects EONIA SWAP market activities within the euro zone and worldwide. Consideration will also be given to a supportive attitude towards EONIA SWAP INDEX.

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Short swaps : The EONIA

OBLIGATIONS OF PANEL BANKS

IV 12

1. Panel banks must quote EONIA SWAP INDEX:
   for the complete range of maturities as indicated by the Steering Committee (ESC); on time as indicated by the screen service provider;
   daily except on Saturdays, Sundays and Target holidays;
   accurately with three decimal places.

JUST FOR INFO

2. Panel banks must make the necessary organizational arrangements to ensure that delivery of the rates is possible on a permanent basis without interruption due to human or technical failure.

3. Panel banks must take all other measures that may be reasonably required by the Steering Committee (ESC) or the screen service provider in the future to establish EONIA SWAP INDEX.

4. Panel banks must subject themselves unconditionally to this EONIA Code and its Annexes, in their present and future form.

5. Panel banks must promote as much as possible EONIA SWAP INDEX (e.g. use EONIA SWAP INDEX as a reference rate as much as possible) and refrain from any activity damageable to EONIA SWAP INDEX

Arbitrage

IV 13

The best offer 1y USD Cash is at 1.20

Instead I take the 12 M IRS/1 at 1.16

It is just like I would take the 1 Y at 1.16 by giving every month the 1M at Libor

As I have, for example, a regular funding monthly well under Libor, I win twice …

Why ?

TOIS, SONIA and Fed Funds Swap

TOIS (Tom-Next Indexed Swap)

An index of CHF T/N offered rates.
(same netting system as Eonia).

SONIA (Sterling Overnight Index Average)

A weighted average rate to four decimal places of all sterling overnight cash

Fed Funds Swap

An OIS in USD where a fixed rate is swapped against the fed funds effective rate calculated daily by the FED

ISDA RECOMMENDED MARKET CONVENTIONS FOR EURO

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- Tois Sonia FFSwap

ISDA International Swaps and Derivatives Association, Inc.

Exhibit 1

RECOMMENDED MARKET CONVENTIONS FOR THE EURO

Euro money markets

- Day count basis: actual/360
- Settlement basis: spot (two day) standard
- Business days: TARGET operating days should form the basis for euro business days

Euro Swap Markets

- Floating day count basis: actual/360
- Fixed rate day count basis: 30/360
- Business days: TARGET operating days should form the basis for euro business days
- Fixing period: two day rate fixing convention
- Coupon frequency: annual

Euro Bond markets

- Day count basis: actual/actual
- Quotation basis: decimals rather than fractions
- Business days: TARGET operating days should form the basis for euro business days
- Coupon frequency: annual
- Settlement dates: the standard for internationally traded cross-border transactions for the euro should remain on a T+3 business day cycle

Euro foreign exchange markets

- Settlement timing: spot convention, with interest accrual beginning on the second day after the deal has been struck
- Quotation: 'certain for uncertain' (i.e. 1 euro = x foreign currency units)
- Reference rate: the ECB (or NCBs) should be responsible for the publication of daily closing reference rates

BS:9951.1

Syllabus
ACI Dealing Certificates

ATF LUXEMBOURG

Chap. 5

- 1. Basic Interest Rate Calculations
- 2. Cash Money Markets
- 3. Foreign Exchange
- 4. Forward-forwards, FRAs and Money Market Futures & Swaps
- 5. Options
- 6. Principles of Risk
- 7. The Model Code
- 8. Sundries

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Options

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Aim:

To understand the fundamentals of options.

To recognise the principal classes and types, and understand the terminology, how they are quoted in the market, how their value changes with the price of the underlying asset and the other principal factors determining the premium, how the risk on an option is measured and how they are delta hedged.

To recognise basic option strategies and understand their purpose.

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Strategies

Candidates should be able to:

- define an option, and compare and contrast options with other instruments
- define strike price, market price, the underlying, premium and expiry
- calculate the cash value of a premium quote
- describe how OTC and exchange-traded options are quoted, and when a premium is conventionally paid
- define call and put options
- explain the terminology for specifying a currency option
- describe the pay-out profiles of long and short positions in call and put options
- describe the exercise rights attached to European, American, Bermudan and Asian (average rate) styles of option
- define the intrinsic and time values of an option, and identify the main determinants of an option premium
- explain what is meant by in the money, out of the money or at the money
- define the delta, gamma, theta, rho and vega
- interpret a delta number
- outline what is meant by delta hedging
- outline how to construct long and short straddles and strangles, and explain their purpose

Principle (comparison with Fx Forward)

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The FX Forward

is a contract
committing the counterparties
the **obligation**
to buy or to sell
at a certain date
a currency against another
at pre-fixed rate.

Principle (comparison with Fx Forward)

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The FX Option

is a contract
providing the owner
the **right**
to buy or to sell
at a certain date
a currency against another
at pre-fixed rate.

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Principle (comparison with Fx Forward)

According the market conditions,
that right will be "exercised" or not.

The option can be seen as an

INSURANCE

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Definition

Fx Forward example.

Today I buy 10.000.0000 EUR/USD FX Forward at **1.2545** value the 23th of December 20XX.

If at that maturity, the market rate is for example

► **1.2520**, I must buy unfortunately at 1.2545.

► **1.2610**, I'm happy to buy at 1.2545

No extra cost.

Definition

FX Option example.

Today I buy the right to buy 10.000.0000 EUR/USD at **1.2545** value the 23th of December 20XX.

If at that maturity, the market rate is for example

► **1.2520**, I don't apply my right and I prefer the market rate.

► **1.2610**, I use my right and I'm happy to buy cheaper at 1.2545

Extra cost : the Option price

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Definition

> *"The FX Option is a contract providing the owner* **(1)** *a right* **(2)** *(not an obligation) to buy* **(3)** *or to sell* **(4)** *at a certain date* **(5)** *a currency against another* **(6)** *at pre-fixed rate* **(7)** *"*

(1) We can buy or sell that right/obligation.
(2) - If I buy the option, I'll have the **RIGHT**
(3) - If I sell the option, I'll have the **OBLIGATION**
(2) That right has a cost. We call that cost the **PREMIUM**
(3) If it a right to buy, we name that contract a **CALL**
(4) If it a right to sell, we name that contract a **PUT**
(5) That date is the maturity of the contract. According to the type of option, we have different possible dates for the execution of the option
(6) The product "traded" is called the **UNDERLYING ASSET**
(7) The pre-fixed rate is also named the **STRIKE**

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Definition

Risk approach *(*)*

1. **Seller** (Writer): He has the guaranty to receive (usually upfront) a premium. Against that, he takes an **unlimited risk**.

2. **Buyer** : The potential **profit is unlimited** for a limited risk, the premium being the maximum and limited cost

(*) deeper analysis later on

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What justify the cost of the premium ?

1. If the strike price is close or far from the **spot** price

2. If the **period** of the option is short or long

3. If the evolution the spot is highly **volatile** or not

4. If the interest rates of the currencies are evolving proportionally or not (**Fx Forward**)

Definition

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Premium

=

f(Fx Spot, Time, Volatility, Fx Forward)

Definition

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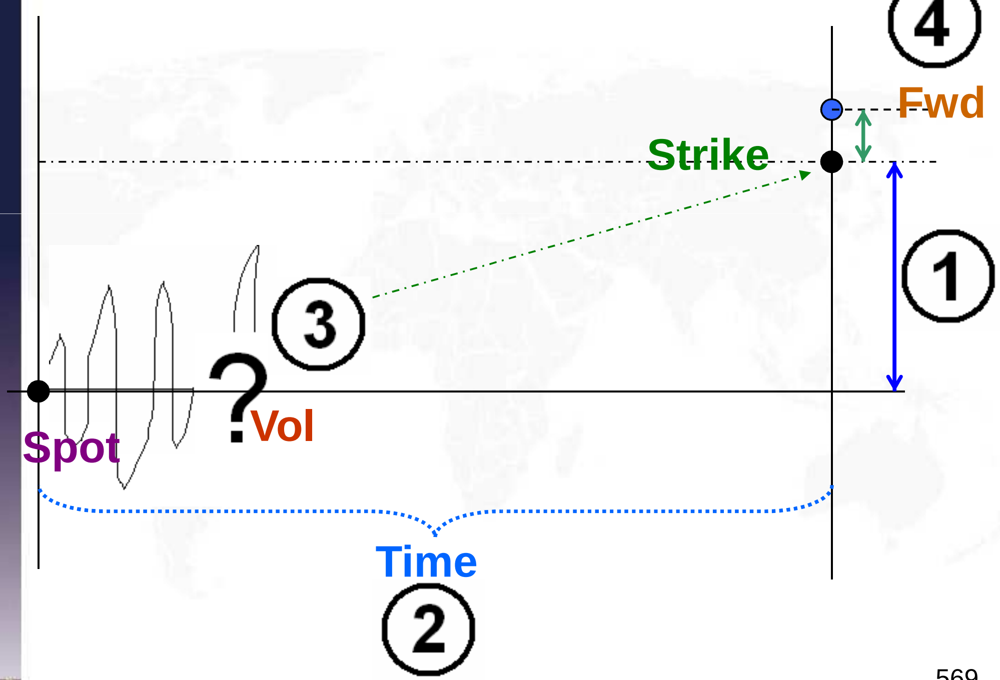
Ex. : in case of Long Call Option

*(I bought the right to **buy** at Strike)*



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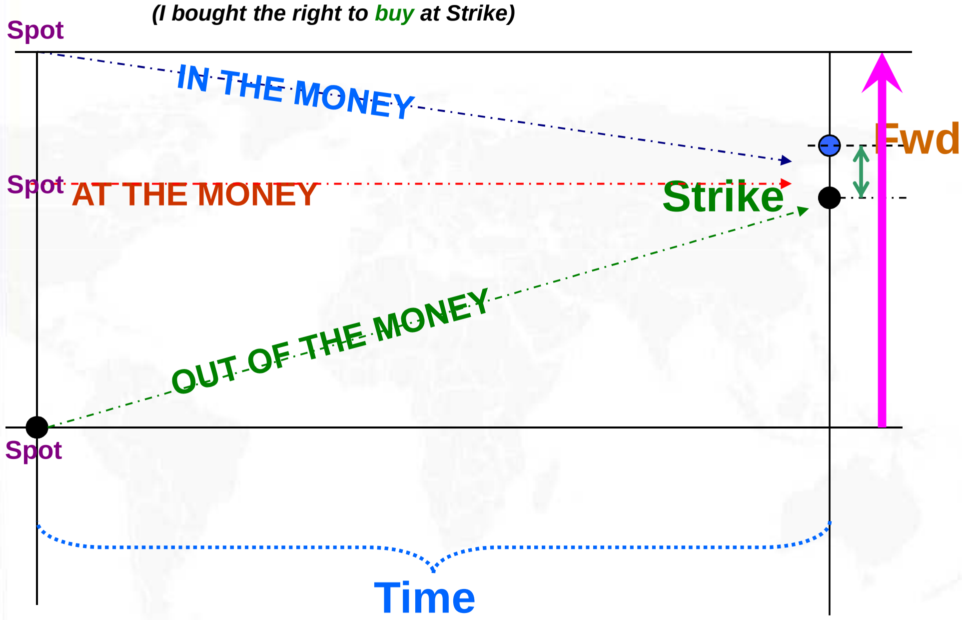
Ex. : in case of Long Call Option

(I bought the right to buy at Strike)



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Definition

STRIKE VERSUS UNDERLYING ASSET PRICE FOR A CALL

- **In the money** : the strike price is smaller than the underlying asset price reference (Spot or Fx Forward)
- **At the money** : the strike price is equals to the underlying asset price reference (Spot or Fx Forward)
- **Out of the money** : the strike price is higher than the underlying asset price reference (Spot or Fx Forward)

Example : call EUR/USD, strike 1.20 if Fx Forward is :

- 1.15 : call out of the money (forward)
- 1.20 : call at the money (forward)
- 1.25 : call in the money (forward)

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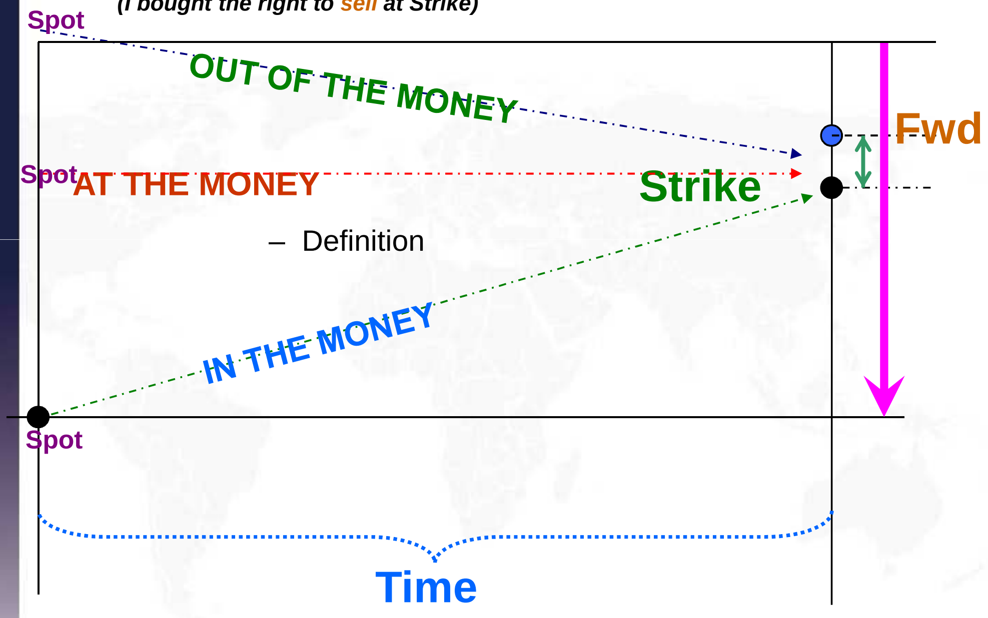
Definition

Ex. : in case of Long Put Option

(I bought the right to sell at Strike)



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Definition

STRIKE VERSUS UNDERLYING ASSET PRICE FOR A PUT

- **In the money** : the strike price is greater than the underlying asset price reference (Spot or Fx Forward)
- **At the money** : the strike price is equals to the underlying asset price reference (Spot or Fx Forward)
- **Out of the money** : the strike price is lesser than the underlying asset price reference (Spot or Fx Forward)

Example : put EUR/USD, strike 1.20 if Fx Forward is :

- 1.15 : put in the money (forward)
- 1.20 : put at the money (forward)
- 1.25 : put out of the money (forward)

(for info but less used now) if Fx Spot is :

- 1.15 : put in the money (spot)
- 1.20 : put at the money (spot)
- 1.25 : put out of the money (spot)

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WHO NEEDS THEM ?

- everybody who has to **manage** a foreign exchange exposure
- widely used by all size businesses (even small companies)
- private investors who want to take a foreign exchange position while limiting their risk

Beneficiary

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WHO NEEDS FX CALL ?

- An importer who orders goods in a foreign currency
- A company which wants to fix maximum foreign investment cost
- A trader who hedges a short position
- A company whose floating debt is in foreign currency : fear of increasing borrowing costs
- A company participating in a tender that wants to protect itself in case of success (importing foreign products)

Beneficiary

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WHO NEEDS FX PUT ?

- An exporter who will receive foreign currencies in payment of its goods
- A commercial company which receives proceeds from abroad (like dividends or royalties)
- A trader who hedges a long position
- An investor who wants protection against a fall in value of a foreign currency (decrease the investment yield)
- A company participating in a tender that wants to protect itself in case of success (paid in foreign currency)

ORGANISED EXCHANGE

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We have for currency options the opportunity to trade :

- on an **Organized Market** places

(Chicago Mercantile Exchange, Euronext-Liffe, Philadelphia stock exchange…)

- on the **Over The Counter** (OTC) mkt

*… in the so called **Interbank Currency Option Market** (ICOM)*

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ORGANISED EXCHANGE

EXCHANGES

We have here the same environment than for the FUTURES

- **Guarantee of the Clearinghouses** and so disappearance of credit risk
- Initial deposit, margin payments and **daily settlement**
- **Liquidity**
- Delivery depends on the market place (if exercised the buyer of the option may receive a currency future contract or a cash payment)
- **Premiums** may be paid upfront to the Exchange or paid through variation margins
- Reporting to the exchange : above some level of open positions, the bank may have upon request to declare its position to the exchange

Example : a person controlling more than 6.000 contracts on the Canadian Dollar futures and options in the CME on the same side of the market (up or down) may have to explain its position and strategy to the Exchange

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ORGANISED EXCHANGE

OVER THE COUNTER

We have here the same environment than for the FRAs :

- Individual dealing
- Flexibility : tailored products (strike, maturity…).
  One thing to notice is the possibility to have tailored currency options in some Exchanges (like the Philadelphia stock exchange)
- The premium is usually paid up front
- Credit line utilization : the credit risk is for the buyer of the option

Price of an Option

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Intrinsic Value

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DEFINITION

- The intrinsic value : price that forbids any arbitrage option/underlying asset
- The intrinsic value : difference between the strike and the forward asset price

For a **call** : IV = AP - S

*The intrinsic value cannot be negative : **IV = 0 while S => AP***

For a **put** : IV = S – AP

*The intrinsic value cannot be negative : **IV = 0 while S <= AP***

With IV = Intrinsic Value,
S = Strike Price,
AP = Asset Price

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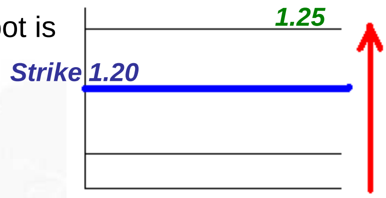
Intrinsic Value

EXAMPLE

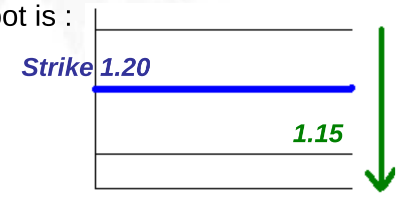
For a **call** : call EUR/USD strike 1.20, if spot is



- 1.25 : IV = **0.05** (1)
- 1.20 : IV = 0
- 1.15 : IV = 0

(1) As I have the right to buy an asset 0.05 pips under the actual mkt price

For a **put** : put EUR/USD strike 1.20, if spot is :



- 1.25 : IV = 0
- 1.20 : IV = 0
- 1.15 : IV = **0.05** (2)

(2) As I have the right to sell an asset 0.05 pips over the actual mkt price

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Time Value

DEFINITION

- The time value : cost associated with the time to expiration.
- The nearer the maturity date, the smaller the time value
- The longer the time value : the higher the risk, the higher the option premium
- **A call option : a "wasting asset"**

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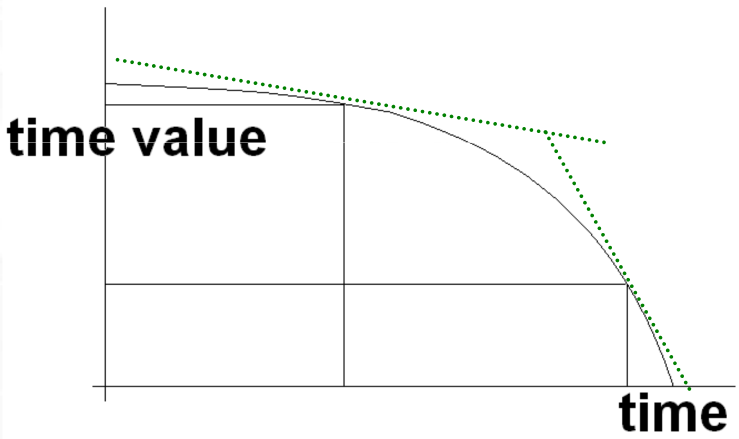
Time Value

NON LINEAR EVOLUTION



When we are far from the maturity, the time change is relatively not important (ex:1day/182days=0.5%) but when we are closer, the time change is relatively much more important (ex:1day/3days=33%)

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Volatility

- Volatility : a fundamental measure of **risk**
- Volatility : a measure of the dispersion of the underlying asset price.
- The higher the volatility, the greater the probability of asset price variations
- The higher the volatility, the higher the risk for the seller
- The higher the volatility : the higher the option price

ATF LUXEMBOURG

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INTEREST RATES

Interest rates have a clear impact and this for two main reason

- The differential of interest rates between two currencies have an ***impact on the forward*** price (we will see that while working later on the sensitivity of the option premium) *formula on the next slide*

- On the OTC market, the premium is paid at the start of the period and there is so a ***financing cost*** for the option

ATF LUXEMBOURG

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INTEREST RATES

Remember :

Sub

$$\text{forward rate} = \text{spot rate}\ \frac{1 + \dfrac{\boxed{\text{interest rate}_{\text{quoted currency}}} \times \text{day count}}{\text{annual basis}_{\text{quoted currency}}}}{1 + \dfrac{\boxed{\text{interest rate}_{\text{base currency}}} \times \text{day count}}{\text{annual basis}_{\text{base currency}}}}$$

Base

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THE PRICE OF AN OPTION

PRICE = INTRINSIC VALUE + TIME VALUE

1. If the strike price is close or far from the **spot** price — **INTRINSIC VALUE**

2. If the **period** of the option is short or long
3. If the evolution the spot is highly **volatile** or not
4. If the interest rates of the currencies are evolving proportionally or not (**Fx Forward**)

— **TIME VALUE**

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THE PRICE OF AN OPTION

Quotation examples :

Quotation Main / Sub :

in pips of the sub per unit of the main

Example : EUR / USD Call, 10.000.000 EUR, price : 10.1 cts / EUR

Premium cost = 1.010.000 **USD** (10.000.000 * 0.101)

Quotation Main / Sub ;

in % of unit of the main

Example : GBP / USD Call, 10.000.000 GBP, price : 3.1 %

Premium cost = 310.000 **GBP** (10.000.000 * 0.031)

(please don't forget : in the OTC market, you can ask how the premium should be expressed by the market maker)

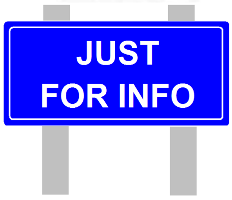
Models

THE MAIN VALUATION MODELS

The two main models are the following :

- The ones that assume that the evolution of prices is distributed according to a Log Normal law: for the currency options this is the Garman and Kohlhagen model (which directly comes from the Black and Scholes evaluation model for the stock prices)

- The ones that assumes that the evolution of prices is distributed according to a binomial law (Cox and Rubenstein, Ho and Lee…)



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Models

THE MAIN VALUATION MODELS

The Garman Kohlhagen model is :

Call = (P * exp (-iT) * N(d1)) – (S * exp (-rT) * N(d2)

With d1 = d2 + (σ * Square root (T))

d2 = 1/(σ * Square root (T)) * (Ln (P/S) + (r – i)*T) – (1/2 * /(σ * Square root (T))

Where :
P = asset price
S = Strike price
T = time to maturity
σ = volatility in %
i = main currency interest rate
r = sub currency interest rate
N(d) = density function of the normal low

LONG CALL EXAMPLE

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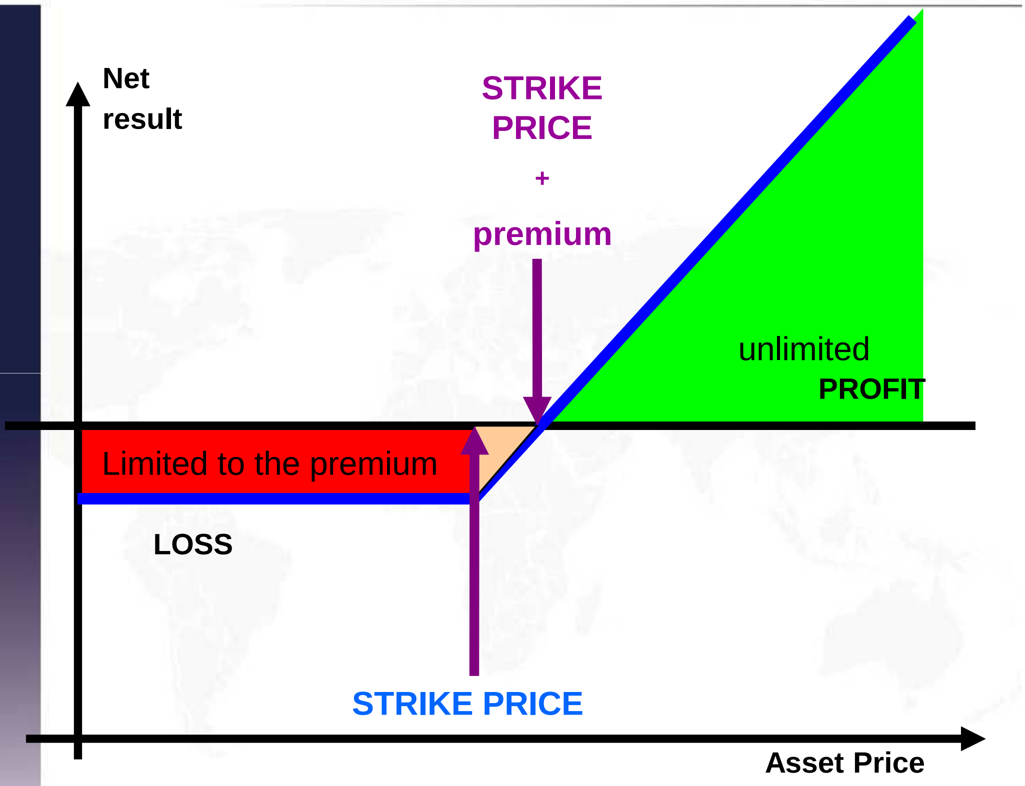

LONG CALL EXAMPLE

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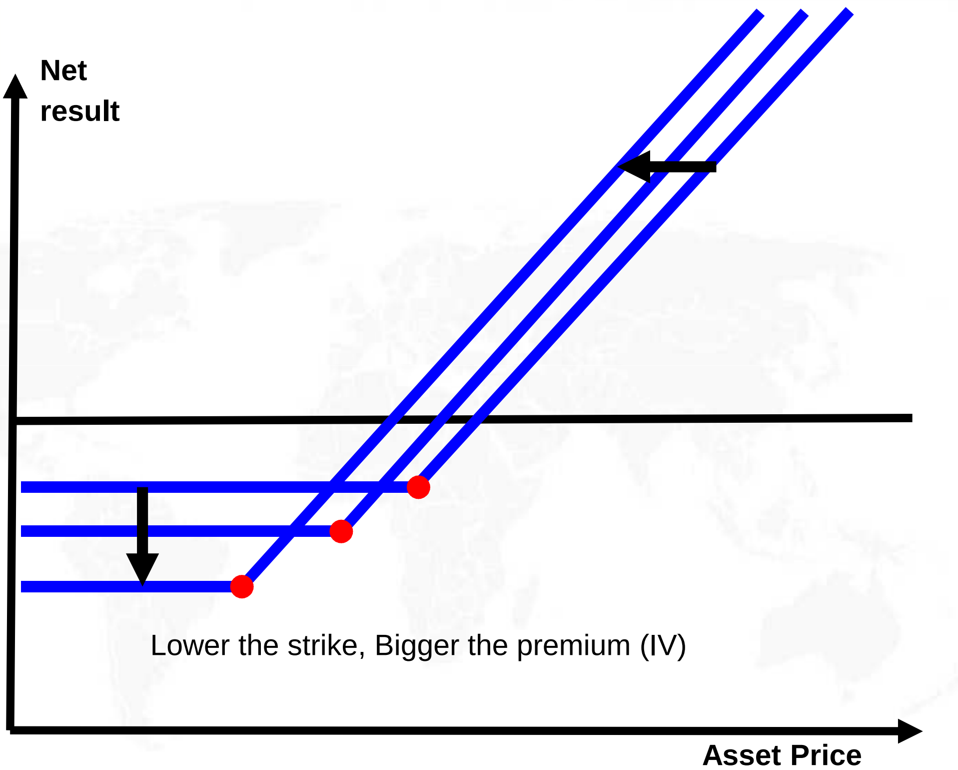

RISK PROFILE analysis LONG PUT

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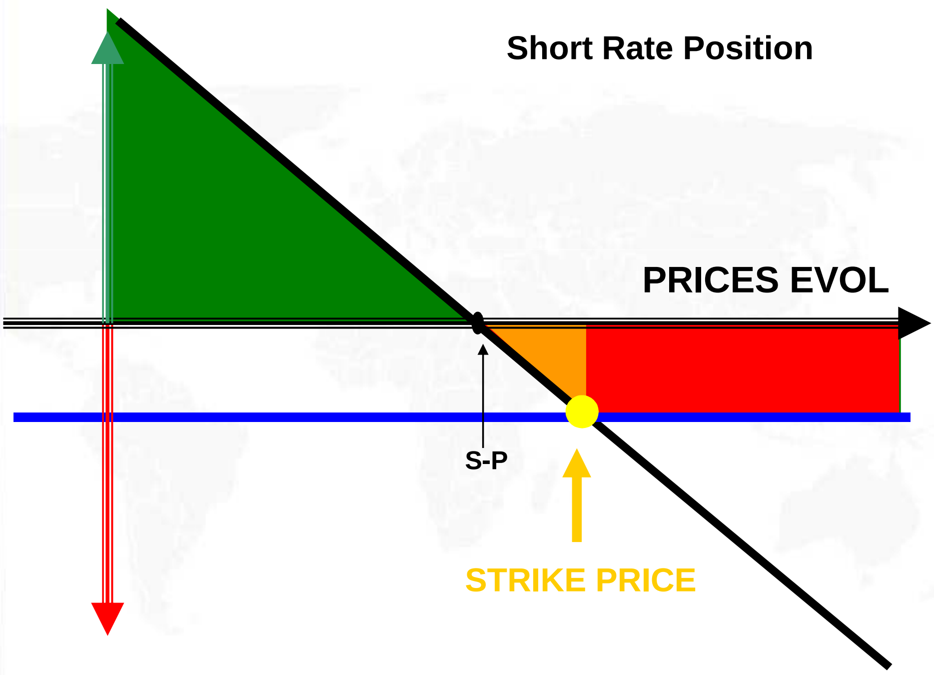
BUYER OF A PUT



RISK PROFILE analysis SHORT CALL

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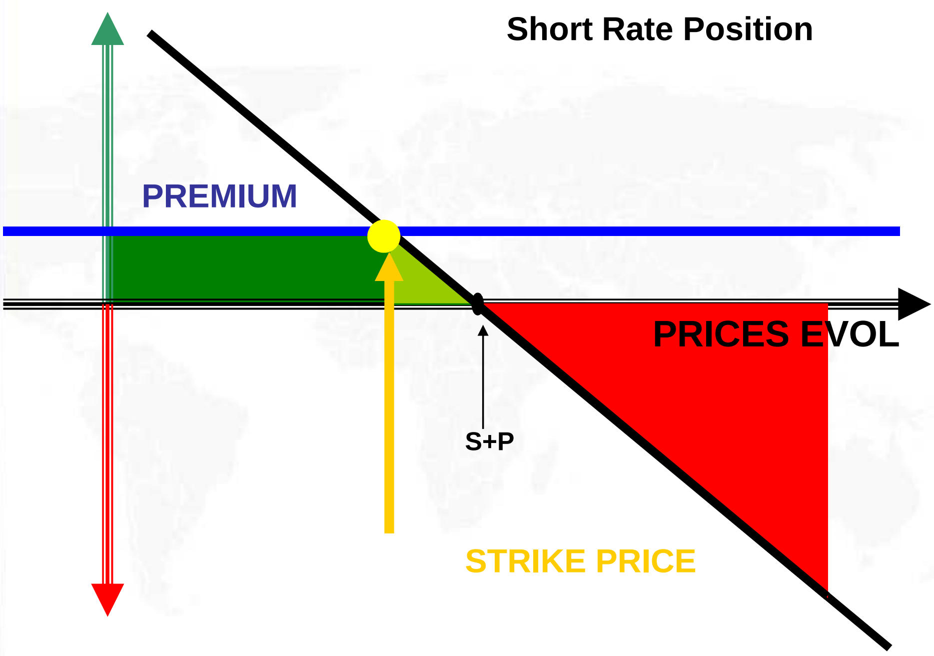
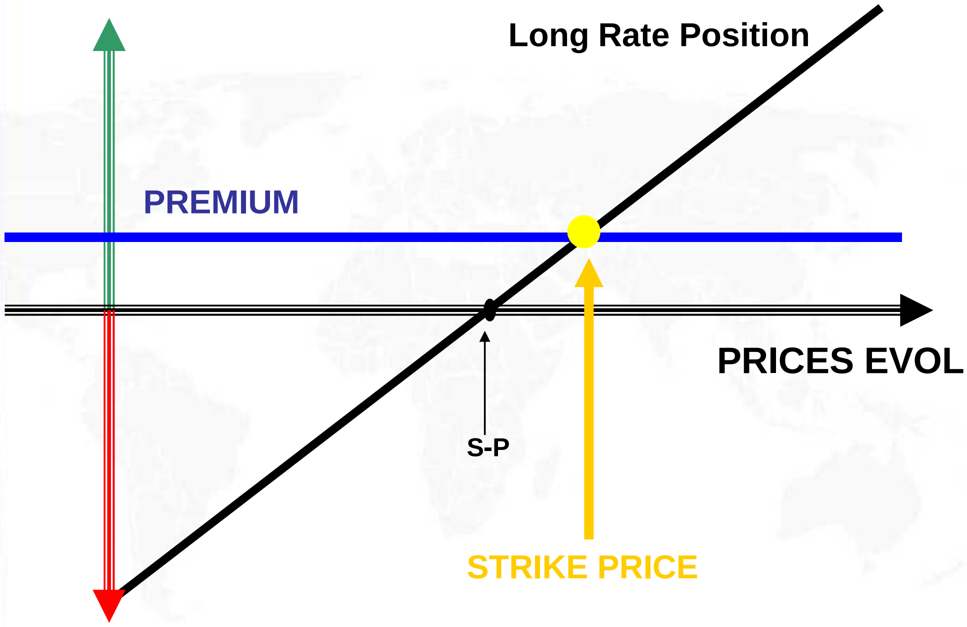
SELLER OF A CALL



RISK PROFILE analysis SHORT PUT

SELLER OF A PUT



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RISK PROFILE analysis SHORT PUT

MKT PRICE > STRIKE

My counterpart will certainly not use its right to sell at a price (strike) cheaper than the market price. So the option will not be exercised and, as seller of that option (put), I'll left with my premium which constitute my full profit
(1)

MKT PRICE = STRIKE

My counterpart must not use its right to sell at a price (strike) equivalent to the market price. So the option has not to be exercised and as seller of that option (put) I'll left with my premium which constitute again my full profit
(2)

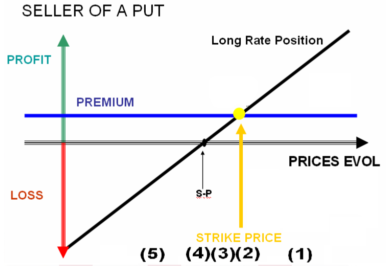
MKT PRICE < STRIKE

In any case, my counterpart will execute the option and I'll have the unfortunate obligation to buy the asset at a more expensive price than the market price

1st case : Premium > Strike – Market Price
Than I 'll keep a profit = Premium – Strike + Market Price (3)

2nd case : Premium = Strike – Market Price
Than I'm break even, no profit, no loss (4)

3rd case : Premium < Strike – Market Price
Than I' make a loss = Premium – Strike + Market Price (5)



RISK PROFILE analysis SHORT PUT

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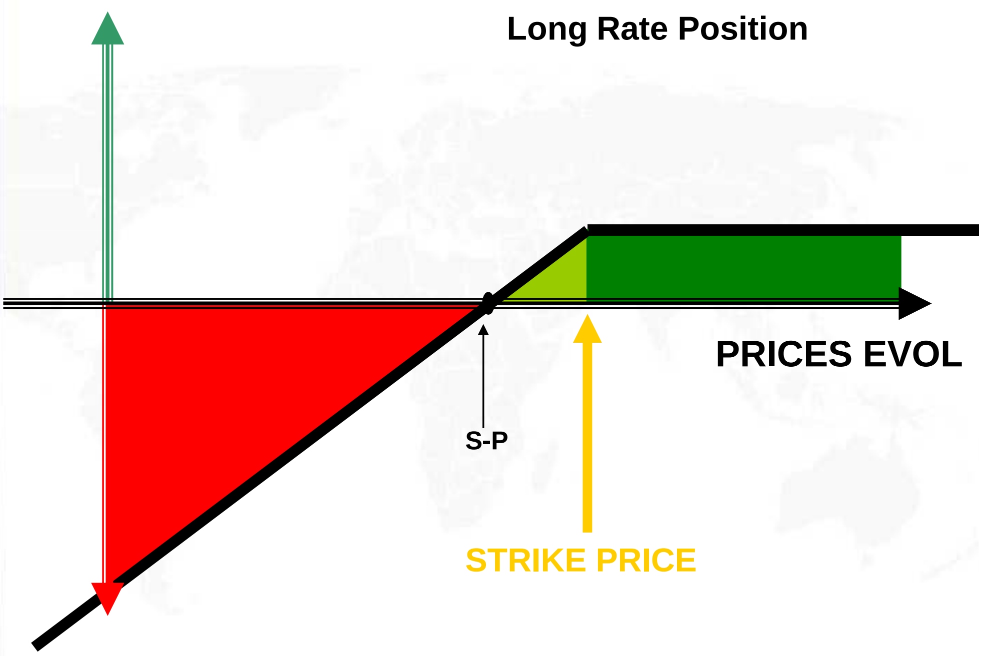
SELLER OF A PUT



RISK PROFILES : Summary

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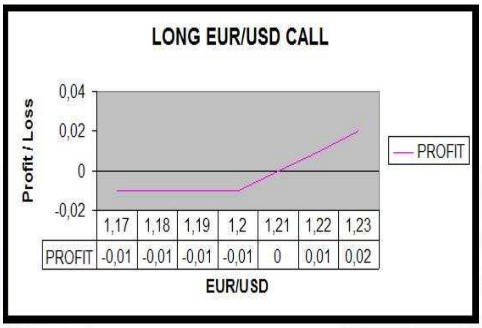
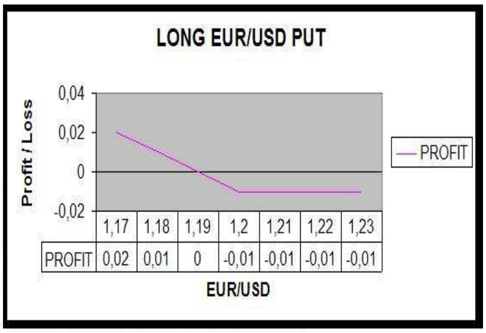
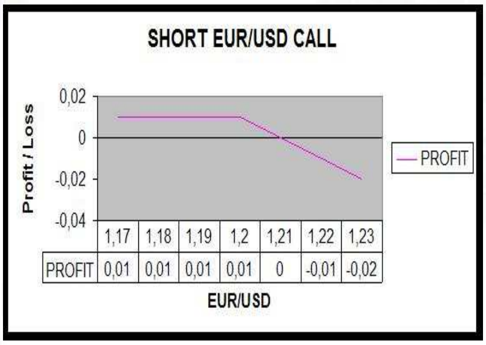


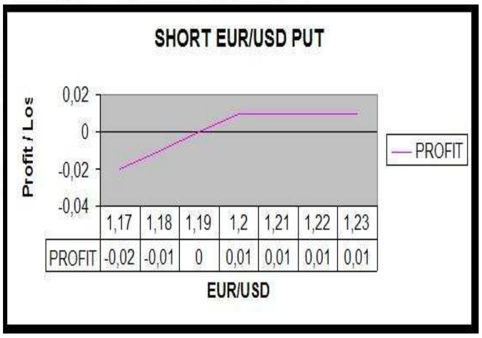
	1,17	1,18	1,19	1,2	1,21	1,22	1,23
PROFIT	-0,01	-0,01	-0,01	-0,01	0	0,01	0,02



	1,17	1,18	1,19	1,2	1,21	1,22	1,23
PROFIT	0,02	0,01	0	-0,01	-0,01	-0,01	-0,01



	1,17	1,18	1,19	1,2	1,21	1,22	1,23
PROFIT	0,01	0,01	0,01	0,01	0	-0,01	-0,02



	1,17	1,18	1,19	1,2	1,21	1,22	1,23
PROFIT	-0,02	-0,01	0	0,01	0,01	0,01	0,01

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	EUR	USD
Value Date		21/11/06
Spot		1,2500
Strike		1,2800
Period		91
USD Rate		3,000%
EUR Rate		5,000%
Volatility		10,000%

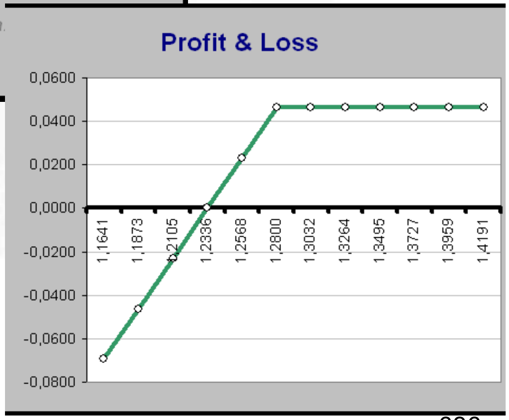
The Greeks	
Garman Kohlhagen's Model	
DELTA	0,3679
GAMMA	5,9876
VEGA	0,2332
THETA	0,0373

Computed Data	
Maturity Date	20/02/07
Outright	1,2438
	cts sub/unit
Premium CALL	0,0104
Premium PUT	0,0464

Risk Profile —> Sell a Put

Sell
Put

Intrinsic Value	0,0300
Strike Status	In the Money
Premium	0,0464
Break Even	1,2336
Profit Potential	Premium
Risk Potential	Unlimited



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THE CALL / PUT RELATIONSHIP

THE CALL/PUT RELATIONSHIP

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Data and assumption :

Buy a EUR/USD call, 91 days,   strike = 1.20

Sell a EUR/USD put 91 days,   strike = 1.20

Assume that Premium Call = Premium Put

Then it's like buying forward at 1.20 :
same risk profile

THE CALL/PUT RELATIONSHIP

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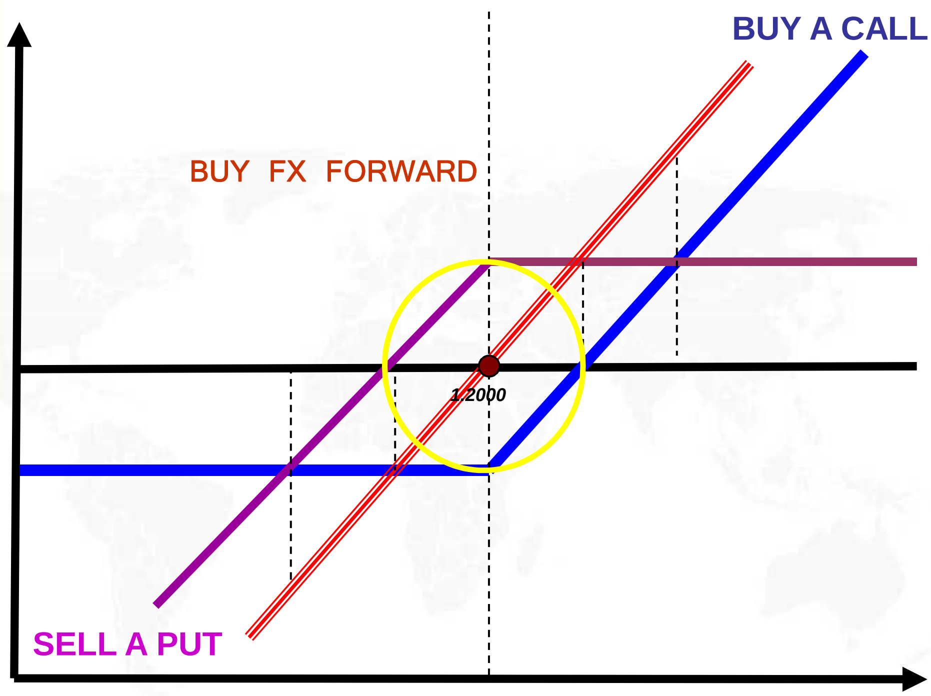

THE CALL/PUT RELATIONSHIP

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We assume that SPOT price **and the STRIKE** **are**
EUR/USD = **1.2000**

- As we know, Forward price is equal to the spot JUST IF both interest rates are the same

- But we know that generally IR are different

In our example :

- interest rates in USD are of **5%** in the 91 days period
- interest rates in EUR are of **3%** in the 91 days period

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Computation :

- interest rates in USD are of 5%
- interest rates in EUR are of 3%

both in the 91 days period

$$\text{forward rate} = \text{spot rate} \; \frac{1 + \dfrac{\boxed{\text{interest rate}_{\text{quoted currency}}} \times \text{day count}}{\text{annual basis}_{\text{quoted currency}}}}{1 + \dfrac{\boxed{\text{interest rate}_{\text{base currency}}} \times \text{day count}}{\text{annual basis}_{\text{base currency}}}}$$

$$\textbf{Fx Forward} = 1.2000 * \frac{1.012639}{1.007584} = 1.2060$$

Consequently Forward points are : **60 points**

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THE CALL/PUT RELATIONSHIP

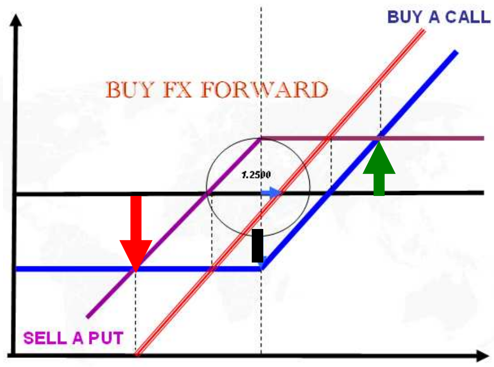
Result :

you bought forward at 1.2000 what should cost forward 1.2060

Arbitrage opportunity !!!

PRICES OF THE CALL AND PUT FOR THE SAME STRIKE AND ON THE SAME MATURITY

HAVE TO BE DIFFERENT



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THE CALL/PUT RELATIONSHIP

To avoid arbitrage, the forward price should be :

$$\textbf{Forward} = \textbf{Spot} + (C - P) * \left\{1 + \frac{\text{Sub Rate * Days}}{100 * \text{Sub Basis}}\right\}$$

Where C = call premium, P = put premium

Then the Call/Put relationship is :

$$\text{Call} = \text{Put} + \frac{\text{Forward} - \text{Spot}}{1 + \left\{\frac{\text{Sub Rate * Days}}{100 * \text{Sub Basis}}\right\}}$$

(on a discount basis cause the premium is paid on the spot date and not at the maturity date)

THE CALL/PUT RELATIONSHIP

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In our example :

- EUR/USD spot price is 1.20,
- EUR/USD forward price 1.2060,
- Put premium is 0.01,
- Call price should be :

$$C = 0.01 + \frac{1.2060 - 1.2000}{1 + (5 * 91 / 36000)} = \mathbf{0.0159}$$

THE CALL/PUT RELATIONSHIP

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In our example : the arbitrage has now vanished

- We buy the call spot at 0.0159
- We sell the put spot at 0.01
- We have a loss in the premium differential of :

(0.0159 – 0.01) * (1 + (5 * 91/36000)) = 0.006

- We have the forward at strike price + the loss in premium = 1.2060
- 1.2060 = exactly the normal forward price according to the spot price

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What we said is true, only if

Strike = Spot

From this, we can find the **general relationship** between Call / Put price with the same strike

(assuming the Strike ≠ the FX forward) :

Call – Put = (F – K) / (1 + ((r * D / (B * 100))))

With :

F = forward price
K = strike
R = interest rate of the sub currency
D = number of days
B = sub currency basis

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SO WE HAVE

Call = Put + (F – K) / (1 + ((r * D / (B * 100))))

And :

Put= Call + (K – F) / (1 + ((r * D / (B * 100))))

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THE CALL/PUT RELATIONSHIP

Example :

What is the price of a EUR / USD Put, strike 1.30, 180 days ?

With :

Spot = 1.28
Forward = 1.2940
USD interest rate = 5.30%
Call price (strike 1.30, 180 days) = **3 cts / €**

Put = 0.03 + (1.30 – 1.2940) / (1 + ((5.3 * 180 / (360 * 100))))

Put = 0.03 + 0.0058

Put Price = 0.0358 so **3.58cts / €**

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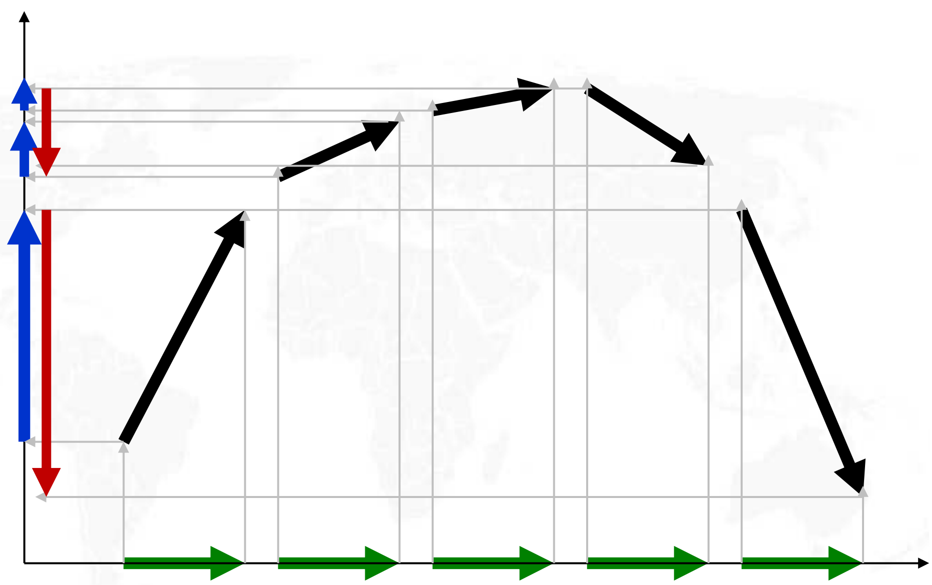
The sensitivity



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Remember : Cost & Sensitivity of the Premium

1. If the strike price is close or far from the **spot** price → **delta & gamma**

2. If the **period** of the option is short or long → **theta**

3. If the evolution the spot is highly **volatile** or not → **vega**

4. If the interest rates of the currencies are evolving proportionally or not (**Fx Forward**) → **rho**

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THE “GREEKS”

These are the risk measurements of an option price :

- Delta (change in price)
- Gamma (change in Delta)
- **V**ega ***or kappa*** (change in the implied **v**olatility)
- **T**heta (change in **t**ime value)
- **R**ho ***or epsilon*** (change in interest **r**ates)

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DELTA DEFINITION

$$\text{Delta } (\Delta) : \frac{\text{Change in the Option Price}}{\text{Change of a unit in the underlying asset value}}$$

Delta (**Δ**) = sensitivity of the premium of the option according to changes in prices of the underlying asset

Position Delta (**Δ**) = measure of exposure / underlying asset

===========Anticipations============

We think the Asset price will rise : need for a + **Δ**
We think the asset will fall : need for a - **Δ**
We have no idea : neutral **Δ** position (= 0 delta position).

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DELTA DEFINITION

Long **Call** : positive Delta (if spot ▲ premium ▲) then 0 < Delta < 1

Short **Call** : negative Delta then -1 < Delta < 0

Example :

a long EUR/USD at the money call has a delta of 0.50, strike 1.25 : if the spot does up to 1.26, the premium of the option will increase by

*(1.26 – 1.25) * 0.50 = 0.005*

Long **Put** : negative Delta (if spot ▼ premium ▲) then -1 < Delta < 0

Short **Put** : positive Delta then 0 < Delta < 1

Example :

a long EUR/USD at the money put has a delta of - 0.75, strike 1.25 : if the spot does down to 1.24, the premium of the option will increase by

*(1.24 – 1.25) * -0.75 = 0.0075*

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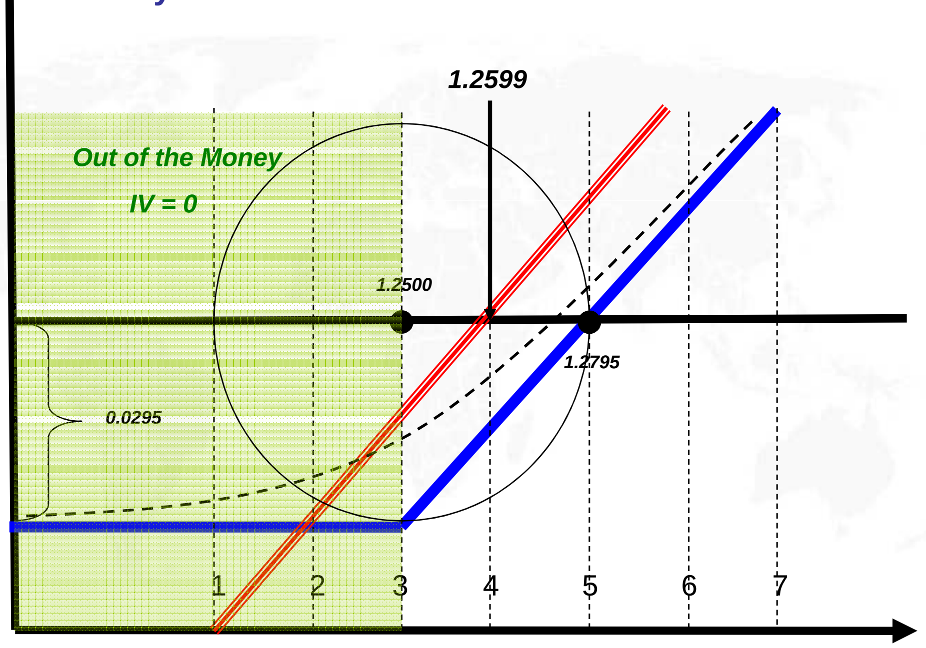
Example

BUY A CALL OTM at 0.0295 pts

Spot 1.2475 Strike 1.2500 FX Fwd 1.2599 BE 1.2795

182 days USD Rate 5% EUR Rate 3% Vol. : 7.5%



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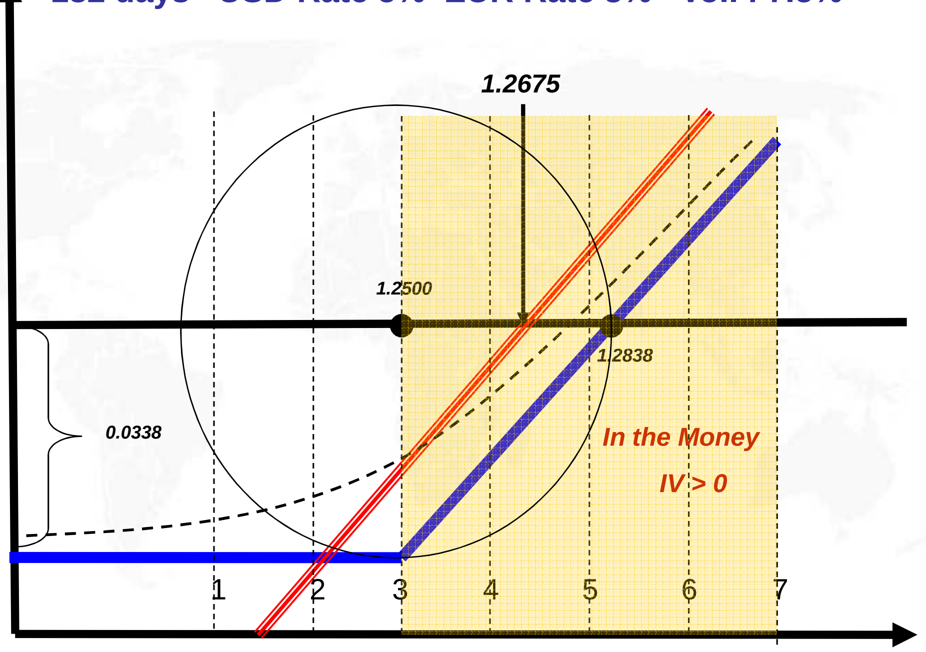
Example

BUY A CALL ITM at 0.0338 pts

Spot 1.2550 Strike 1.2500 FX Fwd 1.2675 BE 1.2838

182 days USD Rate 5% EUR Rate 3% Vol. : 7.5%



Call Premium

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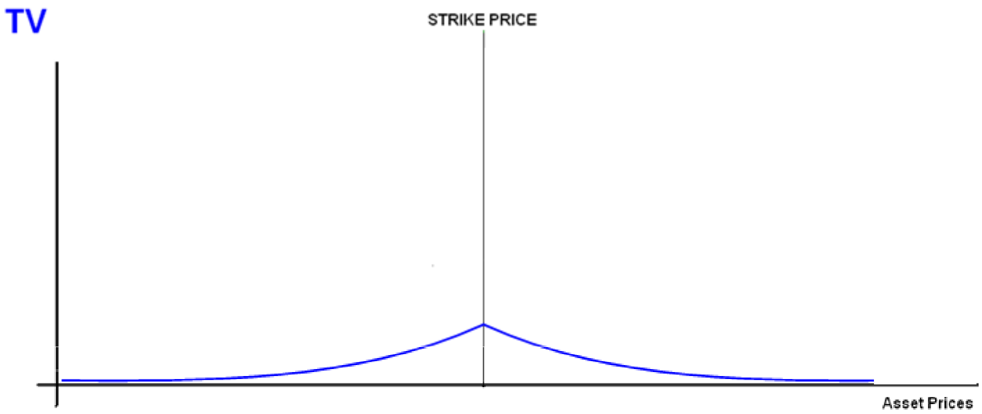
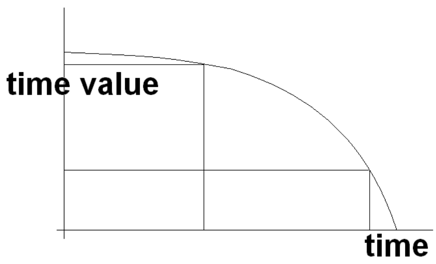


– If we are close to the strike, time does matter a lot

– If we are far from the strike, time doesn't matter very much



This explain the convexity

Call Premium

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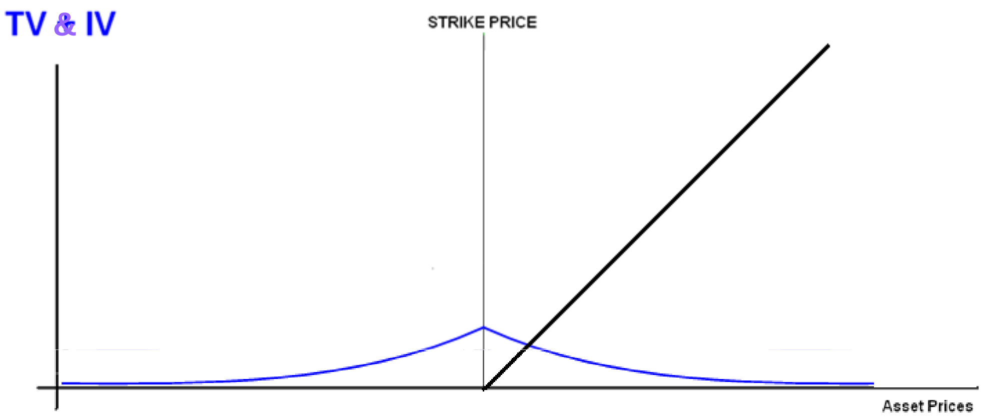

For any given time until expiration, the time value of an option is greatest when the option is at the money, and diminishes as it moves farther either out of the money or in the money. Because theta and vega only measure the effect of time passage and volatility on the time value of an option, both theta and vega are greatest when the time value is greatest, and declines with time value when the price of the underlying moves away from the strike price.

Call Premium

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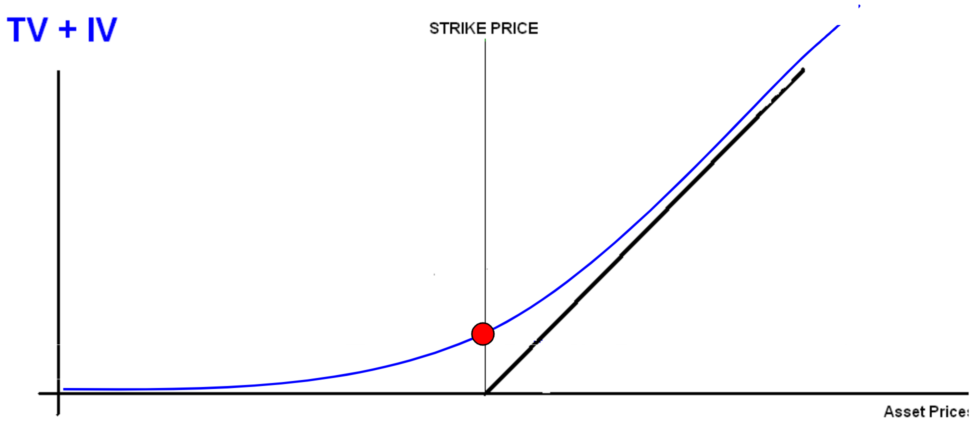


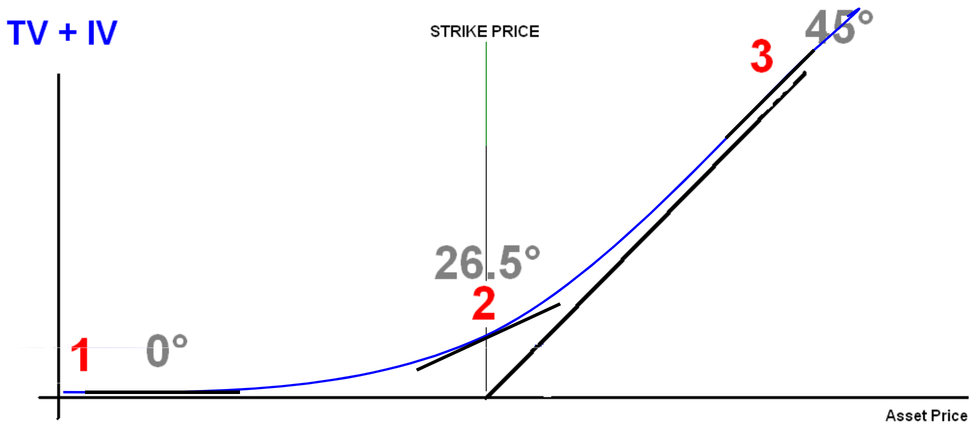
- At The Money we are on 50/50 chance to move left or right
  It explains intuitively why the delta is 0.5 ATM

Call Premium

At Strike price

Just $\frac{\Delta TV}{\Delta AP} = -0.5$

Just $\frac{\Delta IV}{\Delta AP} = 1$



For 1	tan 0° = 0	so Delta = 0	when far OTM
For 2	tan 26.57° = 0.5	so Delta = 0.5	when far ATM
For 3	tan 45° = 1	so Delta = 1	when far ITM

Premium = IV + TV

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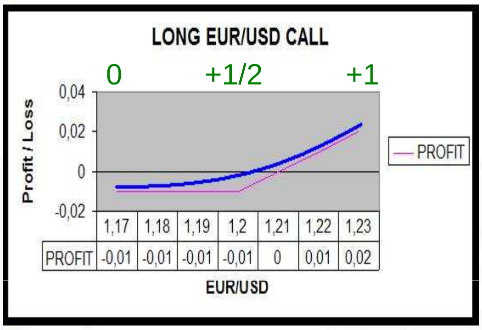

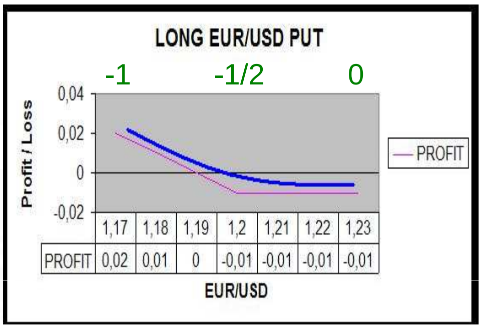

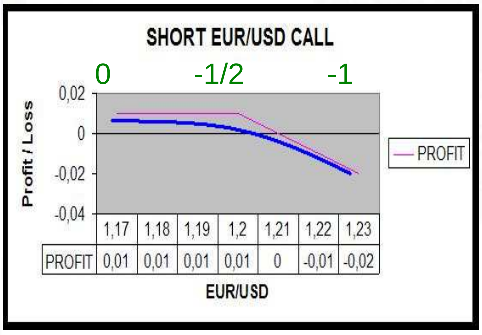

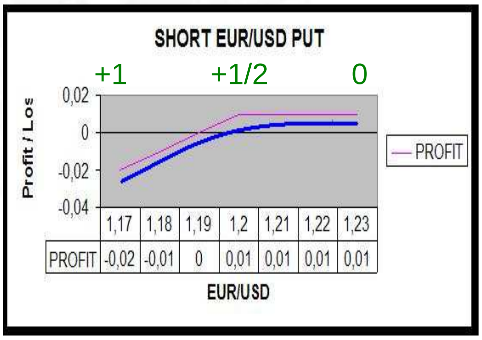

Delta

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DELTA HEDGING

Option ► out-of-the-money : Delta ► 0

Option ► in-the-money : Delta ► +/- 1

Option ► at-the-money : Delta ► +/- ½

Delta exact computation : first partial derivative of the premium formula according to the underlying asset price

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DELTA HEDGING

We have a **Short position** 3 Mths1.000.000 EUR/USD at the Forward Price of 1,1500

Exposure to a **RISE** in the EUR/USD (if €/$ ↑ ¶ ↓)

I use an option to hedge my position

So I need a Call EUR/USD 3 months,
strike 1,1500 (at the money ► Delta = ½),
Premium = 0,10

Remember :

Delta = ½ ► premium moves by 50% of the change in the Forward Price

Question :

What is the amount of EUR Call to buy (or sell) to hedge the bank position ?

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DELTA HEDGING

The bank has to buy EUR 2.000.000 (1.000.000 / 0,50)
Call 3 Mths EUR/USD

Let's check :

If after one day we have a Forward price = **1,1600** ↑

Short Forward Position :
The bank loses : (1,16 – 1,15) * 1.000.000 = **- 10.000 $**

Long Call position :
Value of the 2 M€ call is : 0,10 + ((1,16 – 1,15) * 0.50) = 0,1050

Options earning : 2.000.000 * (0,1050 – 0,10) = **+10.000 $.**

Assuming no transaction costs, the bank is perfectly hedged

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DELTA HEDGING

The bank has to buy EUR 2.000.000 (1.000.000 / 0,50)
Call 3 Mths EUR/USD

Let's check :

If after one day we have a Forward price = **1,1400** ↓

Short Forward Position :
The bank wins : (1,15 – 1,14) * 1.000.000 = **+10.000 $**

Long Call position :
Value of the 2 M€ call is : 0,10 + ((1,14 – 1,15) * 0.50) = 0,0950

Options loss : 2.000.000 * (0,10 – 0,095) = **- 10.000 $**

Assuming no transaction costs, the bank is perfectly hedged

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EXAMPLE OF DELTA VALUES

V 2-3

We have a 182 days,
long EUR/USD call, strike 1.25 :

- If spot = 1.10 then Delta = 0.03
- If spot = 1.25 then Delta = 0.5
- If spot = 1.40 then Delta = 0.94

Gamma

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- As we saw, the Delta of an option is not a constant : it changes according to the underlying asset price variations
- The change is the option's Delta is referred as the Gamma risk

$$\text{Gamma :} \quad \frac{\text{Change in the Delta value}}{\text{Change of a unit in the underlying asset value}}$$

- Gamma can be positive (long call, long put) or negative (short call, short put)
- From a mathematical point of view, it is the second derivative partial of the premium formula according to the value of the underlying asset

Vega (Kappa)

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***Delta and Gamma* measure changes in the premium according to the *real* volatility of the underlying asset**

Vega measures the change in the value of the option according to a change in the **implied volatility**

The implied volatility reflects the market **anticipations** concerning the future evolution of the underlying asset

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Vega (Kappa)

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Vega : $\dfrac{\textbf{Change in the option price}}{\textbf{Change in the implied volatility}}$

- Long call and long put have a positive Vega (we bought options so we bought volatility) whereas short call and short put have a negative Vega (we sold options so we sold volatility)

- From a mathematical point of view, Vega is the partial derivative of the premium formula according to the volatility

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Theta

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We already know that the time value of an option depends on its maturity (time decay)

Theta : $\dfrac{\textbf{Change in the option price}}{\textbf{Change in time remaining to expiration}}$

- Long call and long put have a negative Theta (we bought options so we sold time) whereas short call and short put have a positive Theta (we sold options so we bought time)

- From a mathematical point of view, Theta is the partial derivative of the premium formula according to the volatility

Rho

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We know that the price of an option depends on the interest rates : if they change the forward price at maturity will be impacted and so the value of the option

$$\textbf{Rho} : \frac{\textbf{Change in the option price}}{\textbf{Change in interest rates}}$$

- If the **interest rate of the sub** currency **increases** the value of the **calls increase**, if the interest rate of the main currency increases the value of the calls decrease (see example below)

- From a mathematical point of view, Rho is the partial derivative of the premium formula according to the interest rates

Rho

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Example :

call EUR/USD, strike **1.2500**, 182 days

SPOT = **1.2300**

Interest rate in EUR 3%, interest rate in USD 5%
and so forward price **1.2624**

▶ Intrinsic Value of the Call = $\boxed{0.0324}$

- If the USD interest rate comes up to 7%, the forward is **1.2749**

  ▶ New Intrinsic Value of a new Call would be $\boxed{0.0449}$

- If the EUR interest rate comes up to 4% (and the USD is still at 5%), the forward is **1.2561**

  ▶ New Intrinsic Value of a new Call would be $\boxed{0.0261}$

(the contrary is obviously true for the puts)

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The Greeks

So, we have :

		CALL		PUT	
		LONG	SHORT	LONG	SHORT
DELTA		+	-	-	+
GAMMA		+	-	+	-
VEGA (KAPPA)		+	-	+	-
THETA		-	+	-	+
RHO (EPSILON)	FWD UP	+	-	-	+
	FWD DOWN	-	+	+	-

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European

For the buyer :

- Right but no obligation to buy or sell
- An underlying asset at a fixed price
- On the maturity date (European style option)

The main point to notice here, is that for an European style option, the exercise date is equal to the maturity

American

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For the buyer :

- Right but no obligation to buy or sell
- An underlying asset at a fixed price
- During a period (American style options)

The main point to notice here, is that for an American style option, the buyer can exercise the option whenever he wants during the lifetime of the option

Long Call comparison

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Premium = IV + TV

If you execute an Option, you'll receive
JUST THE INTRINSIC VALUE

Ex. : Strike 1.24 Spot 1.25, I exercise my right to buy at 1.24, **profit 0.01**

If you sell the Option, you'll receive
Premium = IV **+ TV**

Ex. : Strike 1.24 Spot 1.25, the new price of the premium will be old price + 0.01 **+ Time Value**

**SO NEVER EXECUTE, JUST SELL
THEN AMERICAN BECOMES EUROPEEN**

ATF LUXEMBOURG

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Long Call comparison

**SO NEVER EXECUTE, JUST SELL
THEN AMERICAN BECOMES EUROPEEN**

It does explain why the actual reference in FX Option is

the current **Fx Forward**

(remember the general formula in call/put relationship or the definition of in, out, and at the money)

and not the **FX Spot anymore**

ATF LUXEMBOURG

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Bermudan

For the buyer :

- Right but no obligation to buy or sell
- An underlying asset at a fixed price
- But where early exercise is restricted to certain dates during the life of the option

Example : Bermudan call option 1/1/07 – 31/3/07,
early exercise date 1/03/07 :

- 1/1/07 – 1/3/07 : the option cannot be exercised (European style)
- 1/3/07 – 31/3/07 : the option can be exercised at any time (American style)

Bermudan options exercise characteristics :

- Are between those of an European style and American style
- How can I easily remember it ?

THINK ABOUT THE NAME !
(the island of Bermuda lies between Europe and America…)

Asian

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- An Asian ***(Average Rate option)*** is a cash settled option
- The payoff depends on the average value of the underlying asset during the lifetime of the option
- The reference for the foreign exchange rate used has to be agreed between the parties (like the daily ECB fixing rate)
- These options are mainly European style
- Interesting product for companies which have regular currency exposure : they can have a global hedge and don't need to hedge each flow separately

Asian

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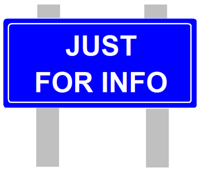
Example : a 91 days EUR/CHF call, strike **1.60** :

- If the average rate of the EUR/CHF during the 3 month is 1.65 (the option is then in the money), the buyer will receive at the maturity 1.65 – 1.60 = 0.05 CHF per EUR

- If the average rate of the EUR/CHF during the 3 month is 1.50 (the option is then out of the money), the buyer will not receive anything at the maturity

- In both cases the buyer will have to deal in the market at the maturity

Binary / Digital



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They have all the characteristics of classical options

At the maturity, there will be a cash settlement

The difference with other options is, if the option is in the money at the maturity, the buyer will receive a fix amount whatever might be the spot on the maturity date

Binary / Digital

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Different sorts exist :

payment is made

- if the option is **in the money at the maturity**
  (all-or-nothing option)

- if the option has been **once in the money** during its lifetime
  (lock-in options)

- if the option has been **always out of the money**
  (lock-out options)

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Binary / Digital

Example : an all-or-nothing 1.000.000 EUR/USD call option, strike 1.25, 91 days

At the maturity :

- spot EUR/USD is 1.30 : the buyer will receive 1.000.000 EUR at 1.25 (the spot is greater than the strike)
- spot EUR/USD is 1.25 : the buyer will receive 1.000.000 EUR at 1.25 (the spot is equals to the strike)
- spot EUR/USD is 1.20 : the buyer will receive nothing (the spot is under the strike)

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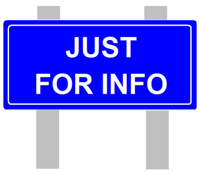
Lookback Strike



These options allow the buyer to take advantage of the most favourable evolution of the underlying asset price during the option lifetime

- Fixed strike **Lookback** : at maturity, the option is exercised at its strike price if the option has been in the money once during its life
- Floating strike **option** : the strike is known only at the maturity. In case of a call, it is the lowest asset price during the period, for a put it is the highest asset price during the period

Lookback Strike

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- Interesting to cover the foreign exchange exposure at the best price during a period

- Obviously, these options are more expansive than classical ones

Lookback Strike

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Example : buyer of a call Lookback fixed strike option EUR/AUD, strike 1.70, 6 months

- During the period, the highest rate of the EUR/AUD was 1.7500, the buyer has the right to buy the EUR/AUD at 1.70

- During the period, the highest rate of the EUR/AUD was 1.6500, the option expires

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Barrier / Knock

JUST FOR INFO

These options are subdivided in two main categories : the “knock-in” and the knock-out”

- the knock-in barrier (exercisable) option start to exist if a certain price of the underlying asset is reached over the lifetime of the option.
- They then become an European style call or put options
- In any case the seller of the option keeps the premium

Please notice that Barrier is sometimes called the INSTRIKE

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Barrier / Knock

- We call “Up and IN” the option which becomes exercisable if the barrier is reached by an increase of the underlying asset price

(example : Call EUR/USD, strike price 1.20, barrier 1.25)

- We call “Down and IN” the option which becomes exercisable if the barrier is reached by a decrease of the underlying asset price

(example : Call EUR/USD, strike price 1.20, barrier 1.15)

Barrier / Knock

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- the knock-out barrier (extinguishable) option disappears if a certain price of the underlying asset is reached over the lifetime of the option.

- We call "Up and Out" the option that disappears if the barrier is reached by an increase of the underlying asset price

  (example : Call EUR/CHF, strike price 1.58, barrier 1.65)

- We call "Down and Out" the option that disappears if the barrier is reached by a decrease of the underlying asset price

  (example : Call EUR/CHF, strike price 1.58, barrier 1.50)

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JUST FOR INFO

Condor

JUST FOR INFO

Cap

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- Thanks to the complexity of the product, options allow to take almost any kind of positions

- As we understood with the sensitivity of the premium, options allows to play time, underlying asset volatility, implied volatility …

- As a result, it is possible to take positions with totally different risk profiles

Synthetic Positions

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LONG ASSET POSITION

A long forward asset position can be created from options through :

- The purchase of a call
- The sell of a put, same maturity, same strike

Example :

- Purchase an EUR/USD call, strike 1.25, 182 days, premium paid 0.039
- Sell an EUR/USD put, strike 1.25, 182 days, premium received 0.027
- We don’t take into account the financing cost coming from the differential between the two premiums (-0.039 + 0.027)

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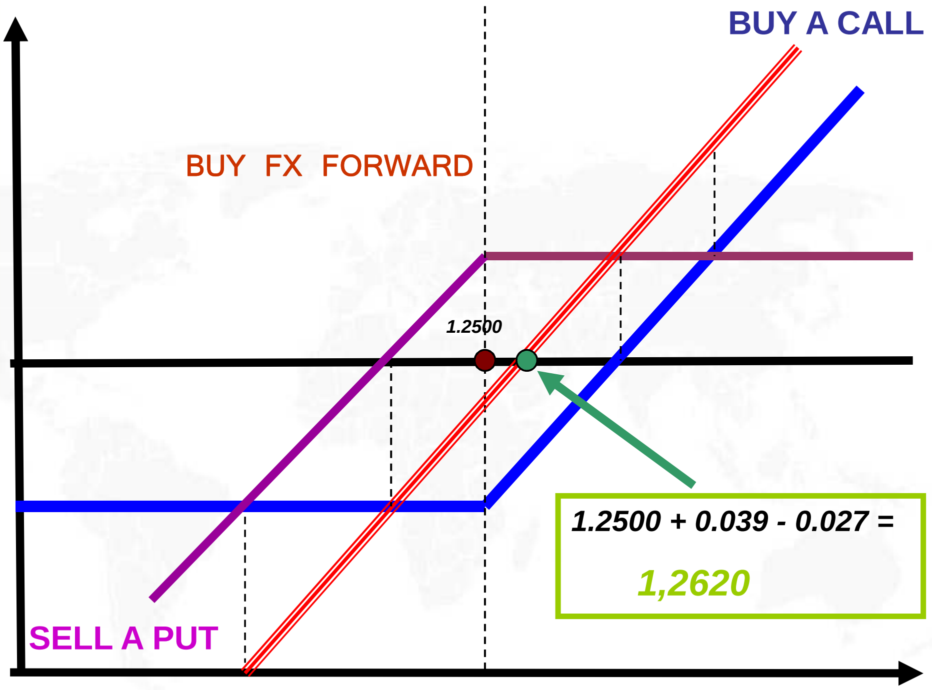

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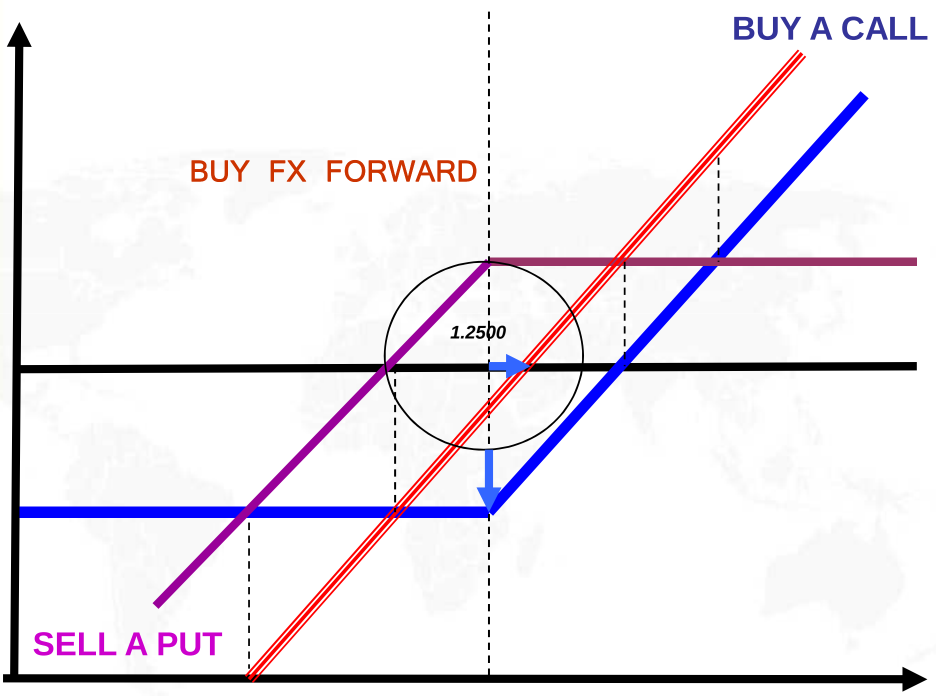

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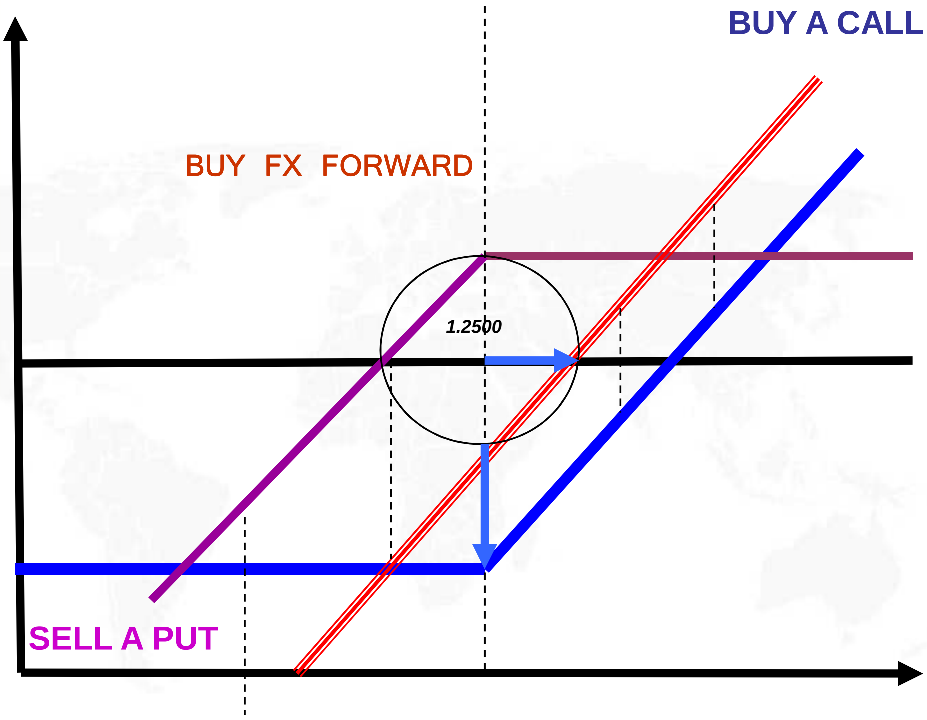

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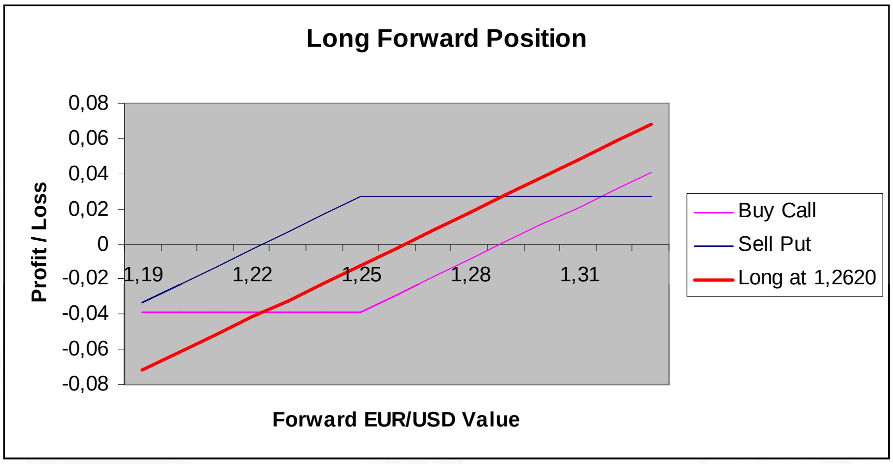

Conclusion : we have the same exposure than buying forward at 1.2620

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LONG ASSET POSITION

Illustration of the Call/Put parity :

(we take here into account the exact value of the options and the cost of financing)

- the forward value of the EUR/USD, spot 1.25, 182 days, interest rate EUR 3%, interest rate USD 5%, is 1.2625
- Here we bought forward at 1.25 but we lose the premiums differential and its financing

Call cost   Put return

$$(0.0396 - 0.0274) * \overbrace{(1 + (5 * 182 / 36000))} = 0.0125$$

There is no arbitrage :

we bought forward at 1.25 + 0.0125 = 1.2625

Synthetic Positions

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SHORT ASSET POSITION

A short forward asset position can be created from options through :

- The purchase of a put
- The sell of a call, same maturity, same strike

Example :

- Purchase an EUR/AUD put, strike 1.66, 182 days, premium paid 0.033
- Sell an EUR/AUD call, strike 1.66, 182 days, premium received 0.054
- We don’t take into account the profit from the investment of the differential between the two premiums (0.054 – 0.033)

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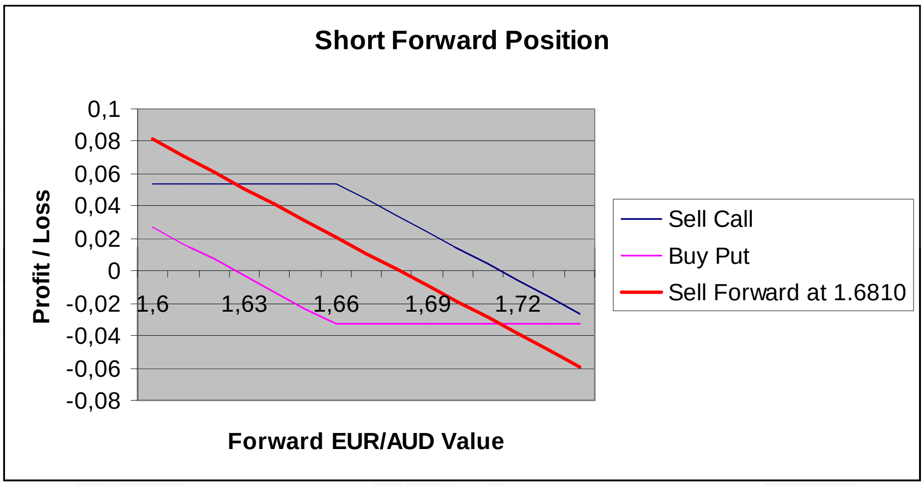

Conclusion : we have the same exposure than selling forward at 1.6810

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SHORT ASSET POSITION

Illustration of the Call/Put parity :

(we take here into account the exact value of the options and the cost of financing)

- the forward value of the EUR/AUD, spot 1.66, 182 days, interest rate EUR 3%, interest rate AUD 5.6%, is 1.6815

- Here we sold forward at 1.66 but we earn the premiums differential and its financing

(+ 0.0539 - 0.0329) * (1 + (5.6 * 182 / 36000)) = 0.0215

There is no arbitrage :

we sold forward at 1.66 + 0.0215 = 1.6815

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Synthetic Positions

Globally, the synthetic positions are :

Long synthetic position :	**Buy Call**	**-**	**Sell Put**	
Short synthetic position :	**Sell Call**	**-**	**Buy Put**	
Long synthetic Call :	**Buy Put**	**-**	**Buy forward**	
Long synthetic Put :	**Buy Call**	**-**	**Sell forward**	**(1)**
Short synthetic Call :	**Sell Put**	**-**	**Sell forward**	
Short synthetic Put :	**Sell Call**	**-**	**Buy forward**	

Or another way to read it :

(1) Having a long Call position, I can transform it to a long Put position just by selling an FX Forward

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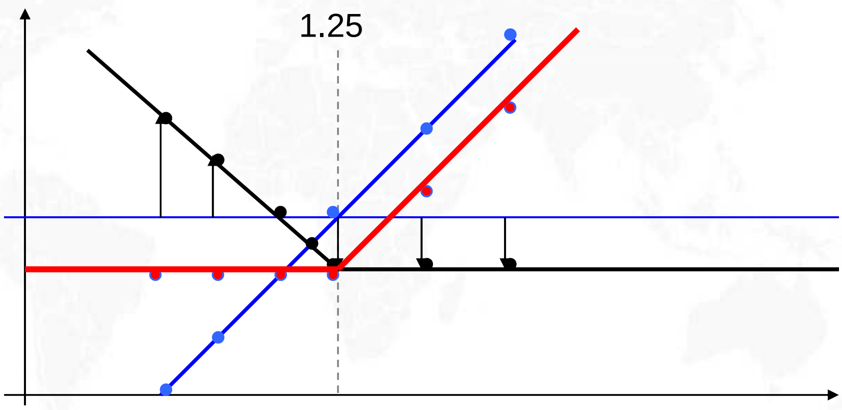
Synthetic Positions

Example :

Long synthetic Call EUR/USD = long Put + buy Forward

Forward price = 1.25
Forward strike = 1.25
Put price = 1 cent / €



The result is a long Call with a strike of 1.25 and a break-even at 1.26

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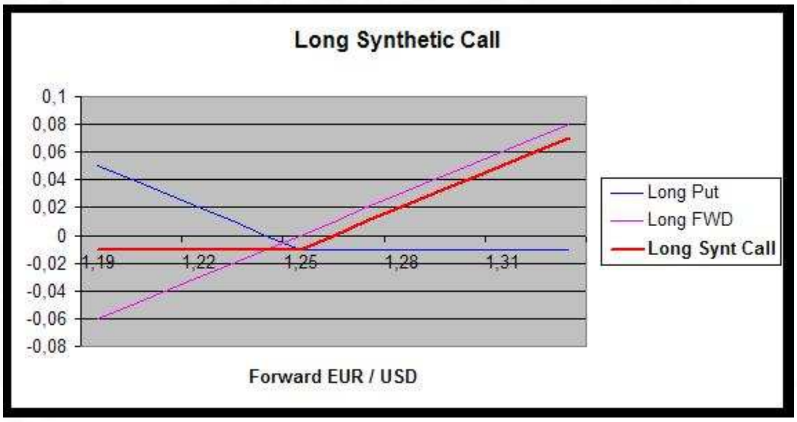
Synthetic Positions

Example :

Long synthetic Call EUR/USD = long Put + buy Forward

Forward price = 1.25
Forward strike = 1.25
Put price = 1 cent / €



The result is a long Call with a strike of 1.25 and a break-even at 1.26

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Straddle

LONG (BOTTOM) STRADDLE

- Volatility strategy : we expect an evolution of the underlying asset price but without playing the direction of the evolution

- Its consist in the purchases of a call and of a put on the same underlying asset, same strike (usually at the money) and same maturity

- The potential loss is limited to the premiums paid and the outcome almost unlimited

Example :

- Purchase of a call EUR/USD, 91 days ,
  strike 1.30, price 0.028
- Purchase of a put EUR/USD, 91 days ,
  strike 1.30, price 0.022

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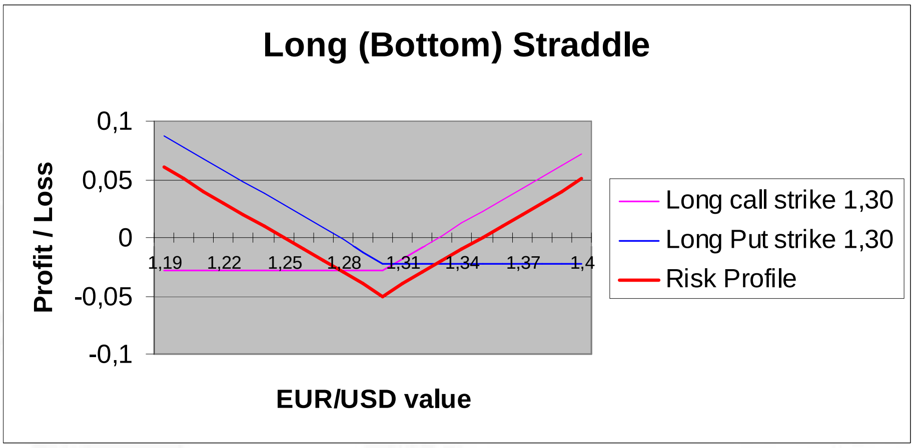
Straddle

LONG (BOTTOM) STRADDLE



With this strategy and these prices, we start to earn money :
- if the EUR/USD is above 1.35 (1.30 plus the 2 premiums paid)
- if the EUR/USD is under 1.25 (1.30 minus the 2 premiums paid)

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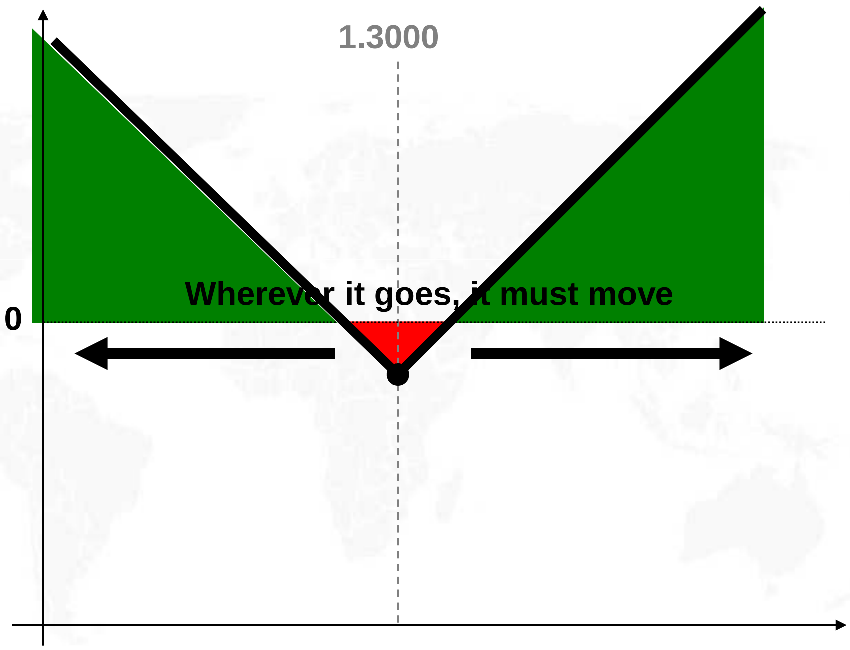
Straddle

LONG (BOTTOM) STRADDLE



Straddle

SHORT (TOP) STRADDLE

- Time strategy : we expect a very limited evolution of the underlying asset price and so a low volatility

- It consists in the sales of a call and of a put on the same underlying asset, same strike (usually at the money) and same maturity

- The potential loss is unlimited and the outcome is limited to the 2 premiums received

Example :

- Sale of a call EUR/USD, 91 days , strike 1.30, price 0.028
- Sale of a put EUR/USD, 91 days , strike 1.30, price 0.022

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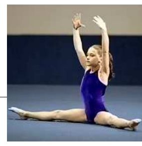
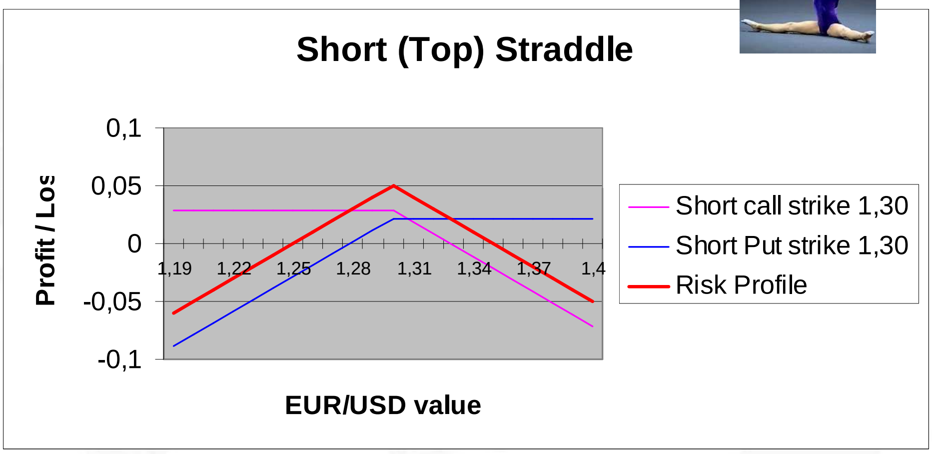
Straddle

SHORT (TOP) STRADDLE





With this strategy and these prices, we earn money if the EUR/USD stays in the range 1.25 – 1.35

Strangle

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LONG (BOTTOM) STRANGLE

- High level volatility strategy : we expect a stronger evolution of the underlying asset price but without playing the direction of the evolution
- Like the Straddle, its consists in the purchases of a call and of a put on the same underlying asset, same maturity BUT the strikes of the options are both **out of the money**
- Cheaper strategy than a straddle but the outcome is lower (as usual…)
- The potential loss is still limited to the premiums paid and the outcome almost unlimited

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Strangle

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Example :

Spot EUR/USD : **1.25**

- Purchase of a call EUR/USD, 91 days , strike 1.28, price 0.014 (out of the money)
- Purchase of a put EUR/USD, 91 days , strike 1.22, price 0.010 (out of the money)

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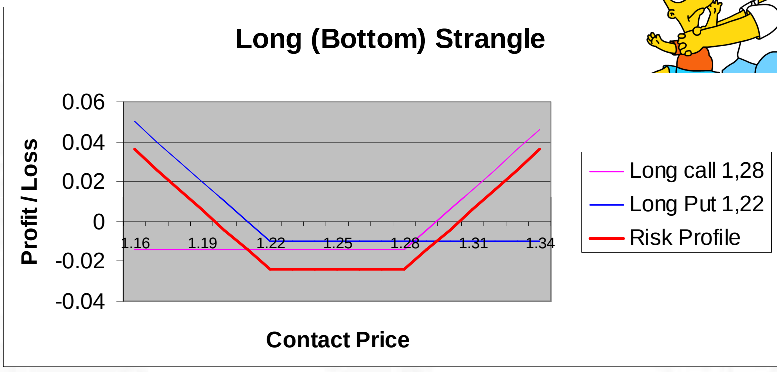
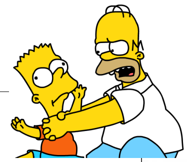
LONG (BOTTOM) STRANGLE





With this strategy and these prices, we start to earn money :

- if the EUR/USD is above 1.304 (1.28 + 0.014 +0.01)
- if the EUR/USD is under 1.196 (1.22 – 0.014 – 0.01)

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SHORT (TOP) STRANGLE

- Like the Straddle, this is a time strategy : we expect a very limited evolution of the underlying asset price and so a low volatility

- Also like the short Straddle, its consists in the sales of a call and of a put on the same underlying asset, same maturity BUT the strikes of the options are out of the money

- As the two options are out of the money the risk is still unlimited, but it is less risky than the short Straddle (and, of course, also less profitable)

ATF LUXEMBOURG

Strangle

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Example :

- Spot EUR/USD : 1.25

- sale of a call EUR/USD, 91 days , strike 1.28, price 0.014 (out of the money)

- sale of a put EUR/USD, 91 days , strike 1.22, price 0.010 (out of the money)

ATF LUXEMBOURG

Strangle

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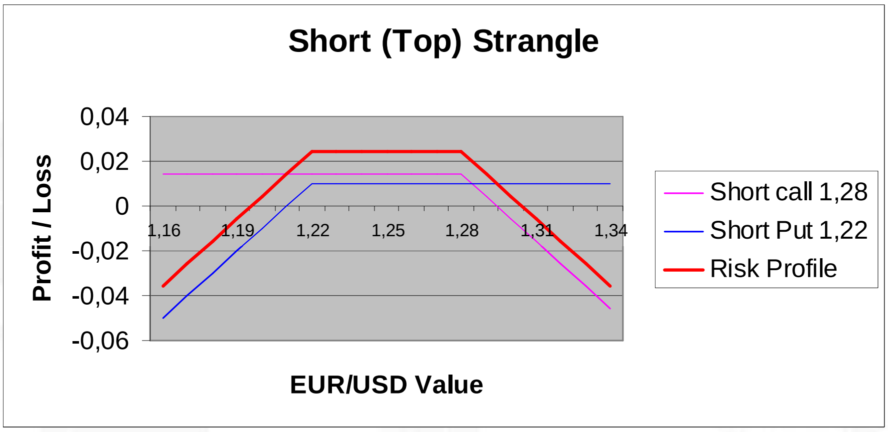
SHORT (TOP) STRANGLE



With this strategy and these prices, we earn money :
if the EUR/USD is ranging between
1.304 (1.28 + 0.014 +0.01) and 1.196 (1.22 – 0.014 – 0.01)

Our potential loss is unlimited

Butterfly

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JUST FOR INFO

LONG BUTTERFLY

- A butterfly is a combination of four options, same maturity :
  - Buy a call/put with a strike S1
  - Sell two calls/puts with a strike S2 (S2 > S1)
  - Buy a call/put with a strike S3 (S3 > S2)

- This strategy consists in taking advantage of a limited change in the underlying asset (between S1 and S3) but without having any idea of the direction

- The maximum loss is limited to the differential between the premiums and the maximum gain is reached at S2

Butterfly

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BUTTERFLY BUYER EXAMPLE

Example :

- Buy a one call GBP/USD, maturity one year, strike 1.70 (S1), premium 0.10

- Sell 2 calls GBP/USD, maturity one year, strike 1.75 (S2), premium 0.07

- Buy a one call GBP/USD, maturity one year, strike 1.80 (S3), premium 0.05

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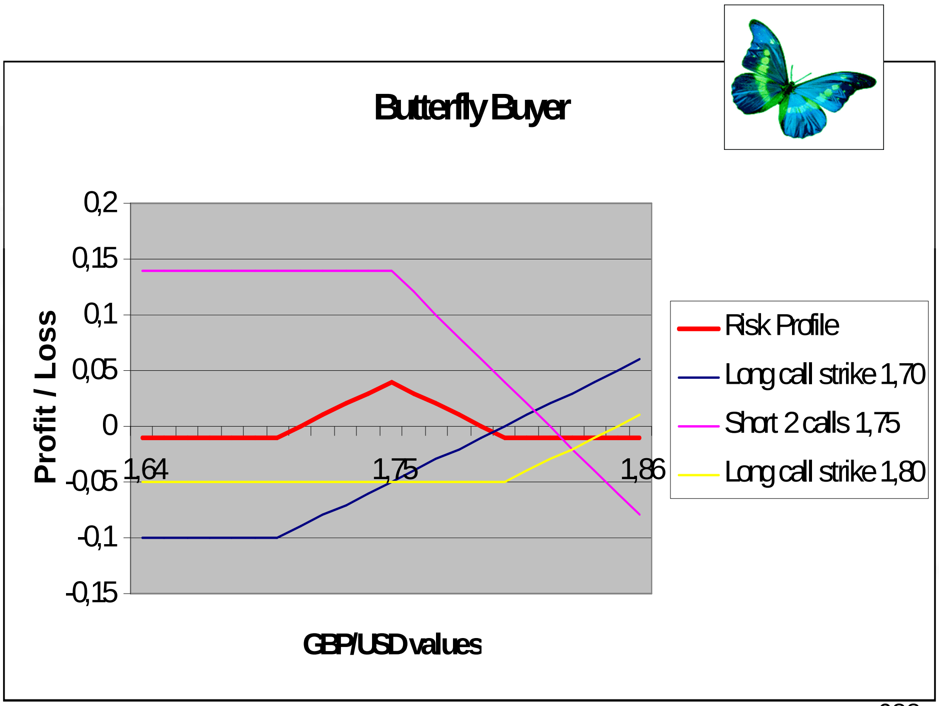
BUTTERFLY BUYER EXAMPLE



Butterfly

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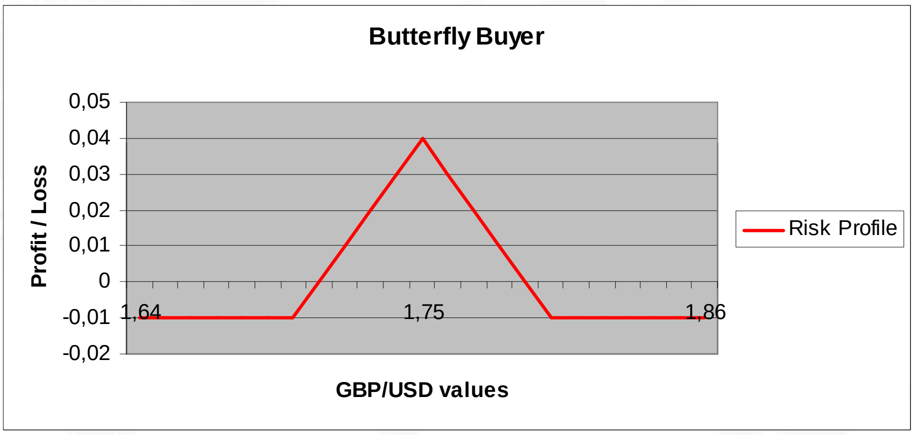
BUTTERFLY BUYER EXAMPLE

The final risk profile is then :



Butterfly

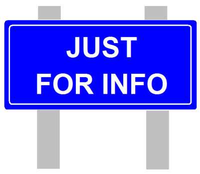
BUTTERFLY BUYER EXAMPLE

So we have :

- Maximum potential earning at point S2 (strike 1.75) which is 0.04
- Loss limited to the premiums differential
  ((2 * 0.07) – 0.10 – 0.05) = - 0.01
- Please notice that the maximum gain of 0.04 is also S2 – S1 – 0.01 (1.75 – 1.70 – 0.01) or S3 – S2 - 0.01 (1.80 – 1.75 – 0.01)

Obviously, to sell a Butterfly would be a strategy that anticipates a high volatility in the underlying asset

Condor



CONDOR BUYER

- A Condor is, like the Butterfly, a combination of four options, same maturity :

- Buy a call/put with a strike S1
- Sell a calls/puts with a strike S2 (S2 > S1)
- Sell a call/put with a strike S3 (S3 > S2)
- Buy a call/put with a strike S4 (S4 > S3)

- This strategy also consists in taking advantage of a limited change in the underlying asset (unlike the Butterfly not at S2 but between S2 and S3) but without having any idea of the direction
- The maximum loss is limited to the differential between the premiums and the maximum gain is reached between points S2 and S3

Condor

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CONDOR BUYER

Example :

- Buy one call GBP/USD, maturity one year, strike 1.70 (S1), premium 0.10
- Sell one call GBP/USD, maturity one year, strike 1.75 (S2), premium 0.07
- Sell one call GBP/USD, maturity one year, strike 1.80 (S3), premium 0.05
- Buy one call GBP/USD, maturity one year, strike 1.85 (S4), premium 0.04

Condor

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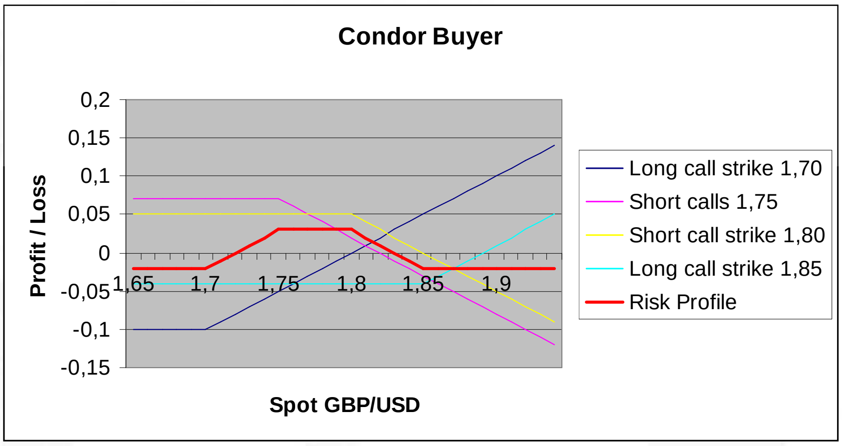
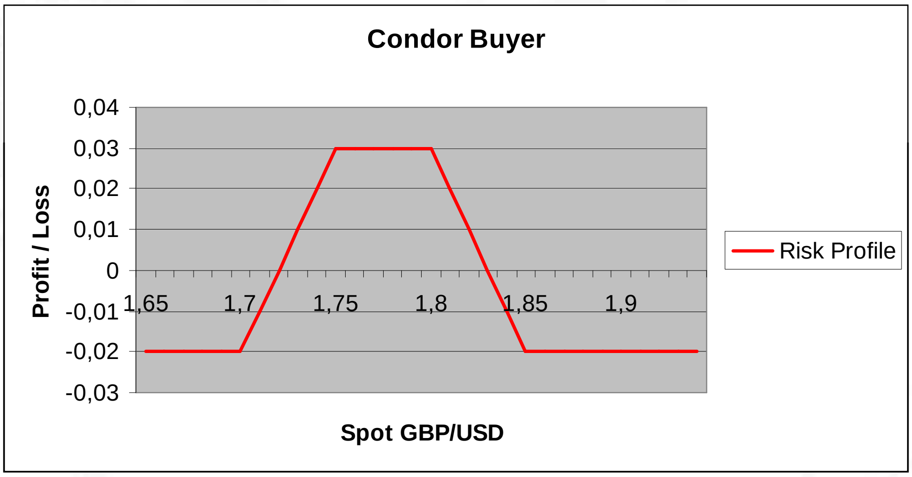
CONDOR BUYER



Condor

CONDOR BUYER

The final risk profile is then :



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Condor

CONDOR BUYER

V 4-5

So we have :

- Maximum potential earning between S2 and S3 (between 1.80 and 1.75) which is 0.03

- Loss limited to the premiums differential (– 0.10 +0.07 +0.05 –0.04) = - 0.02

- Please notice that the maximum gain of 0.03 is also S3 – S2 –0.02 (1.80 – 1.75 – 0.02)

Obviously, to sell a Condor would be a strategy that anticipates a high volatility in the underlying asset (like for the sale of a Butterfly)

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DEFINITION

- A Cap is a combination of options that protects the buyer against an increase in interest rates over a certain period (*can be seen as a combination of successive FRA's)*
- It is used to hedge, for example, a floating rate debt : it fixes the maximum cost of borrowing

- Unlike the other options, the Cap is automatically exercised if in the money for a period

- The buyer of the Cap pays a premium at the start of each period or only at the start of the contract (it is an OTC deal, so everything can be tailored)

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Cap

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EXAMPLE

- A company has borrowed 10.000.000 EUR during three years at a floating six month Euribor rate

- The company wants to hedge itself against an increase in rates and buys a Cap

- The strike of the Cap is 4 % & the *annual premium* is 0.15%

- The premium is paid every year

- Usually the buyer receives a cash payment (if the option is in the money), on a discounted basis at the start of each floating period : to make the things easier, we voluntarily won't take into account the discounted factor (which depends on the fixing of each floating period)

Cap

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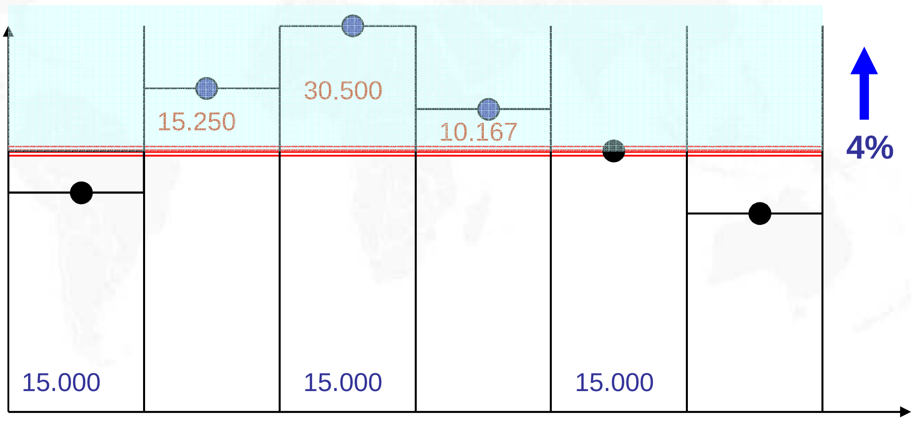
EXAMPLE

PERIOD	Number of days	Premium paid	Euribor 6 month fixing	Payment received by the buyer
6	182	15 000	3,80%	0
12	183		4,30%	**15 250**
18	183	15 000	4,60%	30 500
24	183		4,20%	10 167
30	182	15 000	4,00%	0
36	183		3,70%	0

Where **15.250** = (4.30 – 4.00) * (183 / 36000) * 10.000.000



Floor

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DEFINITION

- A Floor is a combination of options that protects the buyer against a decrease in interest rates over a certain period
- It is used to hedge, for example, a floating rate loan : it fixes the minimum return on investment
- Like the Cap, the floor is automatically exercised if in the money for a period
- The buyer of the Floor pays a premium at the start of each period or only at the start of the contract (it is an OTC deal, so everything can be tailored)

Floor

EXAMPLE

- A bank has lent 15.000.000 GBP during two years at a floating three month Libor rate
- The bank wants to hedge itself against a decrease in rates and buy a Floor
- The strike of the Floor is 5 % and the *annual premium* is 0.20 %
- The premium is paid every year
- Again, we won't take into account the discounting factor of the three month payments if the option is in the money

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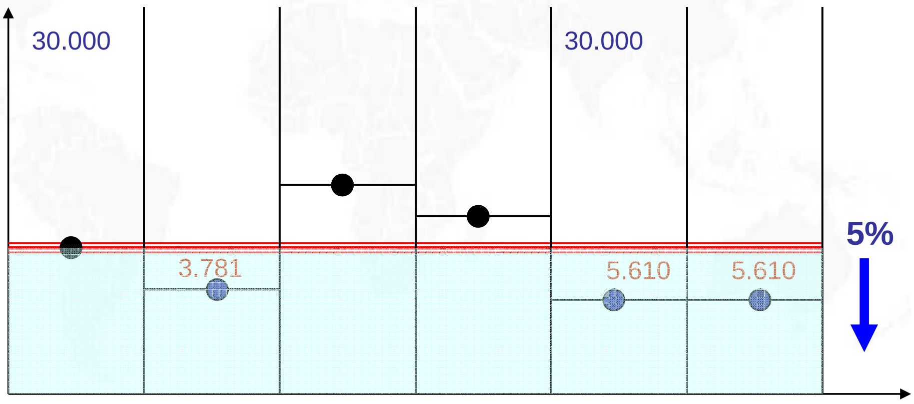
EXAMPLE

PERIOD	Number of days	Premium paid	Libor 3 month fixing	Payment received by the buyer
3	91	30 000	5,00%	-
6	92		4,90%	3 781
9	91		5,20%	-
12	92		5,10%	-
15	91	30 000	4,85%	5 610
18	91		4,85%	**5 610**
21	92		4,75%	9 452
24	91		4,75%	9 349

Where : 5.610 = (5.00 – 4.85) * (91 / 36500) * 15.000.000



Cylinder / Collar

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Options

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DEFINITION

- These strategies intend to reduce the cost of hedging against having not the full benefit of an increase or decrease in rates

- For interest rate we will use the word Collar and for foreign exchange, we will use the word Cylinder

- **The Collar is the result of a combination of a Cap and a Floor :**

The borrower of a Collar will :
buy a Cap and
sell a Floor
(same amount, maturity, interest rate reference

The lender of a Collar will :
buy a Floor and
sell a Cap
(same amount, maturity, interest rate reference)

Cylinder / Collar

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DEFINITION

The cost of the hedge is lower than for a single Cap or Floor :

a premium is paid for the option purchase but
a premium is received for the option sale

It is possible to build a 0 cost Collar (same premium for the option sold and the option purchased) but, as the two strike prices are very closed, it reduces considerably the potential benefit of the hedge

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EXAMPLE

- A bank has borrowed 10.000.000 EUR during three years at a floating six month Euribor rate
- The company wants to hedge itself against an increase in rates and borrows a Collar
- The strike of the Cap is **4.10** %
  and the premium is 0.20 % (paid by the bank)
- The strike of the floor is **3.80** %
  and the premium 0.10% (received by the bank)
- The Cap is at the money and the Floor is out of the money (which explains the difference between the premiums paid and received)
- The premium are paid every year

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Cylinder / Collar

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EXAMPLE

PERIOD	Number of days	Premium paid	Premium Received	Euribor 6 month fixing	Payment for by the bank	Payment by the bank
6	182	- 20 000	10 000	4,10%	-	-
12	183			4,17%	3 558 ***	-
18	183	- 20 000	10 000	4,21%	5 592	-
24	183			4,08%	-	-
30	182	- 20 000	10 000	3,75%	-	- 2 528 ***
36	183			3,72%	-	- 4 067

With :

3.558 = (4.17 – 4.10) * 10.000.000 * (183 / 36000)
- 2 528 = (3.75 – 3.80) * 10.000.000 * (183 / 36000)

Cylinder / Collar

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EXAMPLE

The result of this strategy is :

- The bank is hedged against an increase (yearly basis) in rates above 4.20 % : 4.10 % + 0.10 %
  (strike of the Cap + differential in premiums)

- The bank will not take advantage of a decrease (yearly basis) in rates under 3.90 % : 3.80 % + 0.10 %
  (strike of the floor + differential in premiums)

Cylinder / Collar

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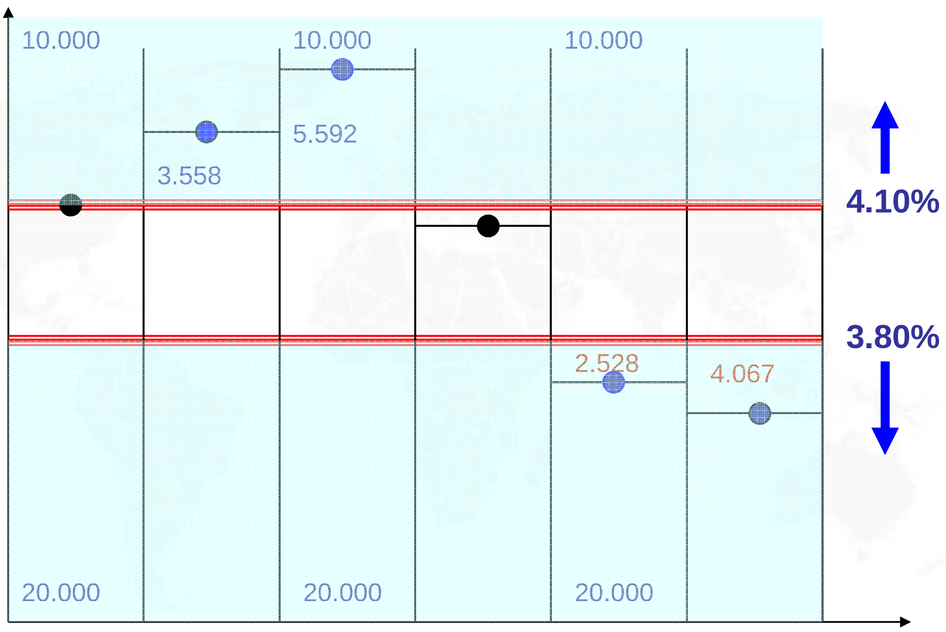

Syllabus
ACI Dealing Certificates

Chap. 6

1. Basic Interest Rate Calculations
2. Cash Money Markets
3. Foreign Exchange
4. Forward-forwards, FRAs and Money Market Futures & Swaps
5. Options
6. Principles of Risk
7. The Model Code
8. Sundries

Principles of Risk

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Aim

To identify and distinguish between the principal types of risk in the markets, and to explain the main policies and procedures used to mitigate these risks. To understand the principles of position-keeping and valuation, using spot FX as an example.

Principles of Risk

Should know

- define and distinguish between credit, market, liquidity, operational, legal, settlement and basis risks, and identify these risks in basic money market instruments
- define and distinguish between transaction, translation and economic currency exposures
- define replacement cost
- explain the purpose of netting, and distinguish between bilateral and multilateral netting
- define settlement risk in FX and outline how this is managed through the Continuous Linked Settlement (CLS) system
- describe how the credit risk on spot and forward FX instruments changes over time
- explain which risks are hedged by collateral and which risks are introduced
- calculate the position and average rate of a series of spot FX transactions, and the profit or loss for a given revaluation rate
- explain the purpose of documentation
- explain the purpose of risk capital
- define nostro and vostro accounts, and outline their function
- explain what is meant by reconciliation
- distinguish between overnight and daylight limits
- distinguish between position, loss and risk (VaR-type) limits
- distinguish between hedging and arbitrage
- explain what is meant by long and short positions, how short positions are created and the risk on a short position

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Principles of Risk

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Since 2004, the ACI has redefined the risk chapters :

- Before 2004, there were two parts : the "Risk management and Control" (4 questions) and the "Market Convention and Environment" (5 questions)

- Now these two subjects have been absorbed in one new section : "The Principles of Risk" (5 questions)

This was done to achieve a better balance in the Certificate.

Principles of Risk

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We can divide this new "Principles of Risk" section in three parts :

- **Position keeping** using a FX example : this part is explained in details in the FX section (which seemed logical while explaining the FX market)

- **The risk environment** : risk typologies, types of exposures ….

- **The back office world** : function, settlement systems…

Principles of Risk

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- Risk is now a key subject in the dealing rooms
- The 80's and the start of the 90's were focusing still much more on performance than on risks

In this chapter, we will :

1) Present the typologies of risks
2) Detail the risks attached to the different financial instruments
3) Present the Basel Committee for banking supervision works and their updates

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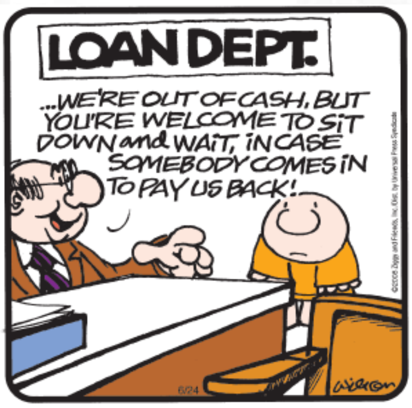
There are various kind of risks that banks and companies have to face :

- Market risk
- Credit risk *(Credit, Settlement & Replacement*
- Liquidity risk
- Operational risk
- Translation risk
- Economic risk



Market Risk

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Definition :

- The market risk is the risk linked to the evolution of the market prices
- It exists for all open positions, mismatched position (equities, interest rates, foreign exchange, commodities) and even for some hedged positions (basis risk : please refer to STIR Future part for this subject)

Example :

a trader who has a long/short position in interest rate has a market risk considering the evolution of interest rates

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Management :

- Need to make a regular (daily) mark-to-market of the positions : what is the value of my position according to the current market prices and what are the profits and losses of these positions ? Here, we can use the market prices (spot, forwards…) or the traditional net present value methods (FX swaps, IRS, CD…)

- The bank management has to set clear dealing rules to control it (stop losses, overnight position in the FX market…)

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Value At Risk (VAR) :

it measures the **probability** of loss under normal market conditions over a period of time (at a given confidence level)

Example :

A **10** day **99%** VAR of **EUR 5** millions for a dealing room :

there is a 1% probability that the dealing room will lose more than EUR 5 Millions in the next trading days according to the current positions

(please also refer to the last section of the risk environment chapter concerning BASEL II for this subject)

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Credit Risk

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Definition :

- The credit risk is the risk of loss due to the counterparty default : it is also called the COUNTERPARTY RISK
- It is also the risk linked to a change of rating (credit quality) of a counterparty (if a the credit rating of a paper issuer goes down, the risk on this issuer increases and the value of the paper goes down)
- It may concern the name of an issuer (Certificate of deposit, Commercial Paper, bonds…), the trading counterparty (OTC trades and organized exchange trades done through non-exchange members) or the collateral name (Repurchase agreement)

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Credit Risk

Example :

the buyer of a Certificate of Deposit
(the lender of the cash)
may not see its money back
if the banking counterparty goes bankruptcy during the CD period

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Credit Risk

Banks and companies are “rated” by **rating** agencies like Moody’s, Standard & Poor’s or Fitch.

Example of long-term credit rating by the three main agencies :

	Standard & Poor's	Moody's	Fitch
INVESTMENT GRADE	AAA, AA, A, BBB	Aaa, Aa1, Aa2, Aa3, A1 A2, A3, Baa1, Baa2, Baa3	AAA, AA, A, BBB
SPECULATIVE GRADE	BB, B	Ba1, Ba2, Ba3, B1, B2, B3	BB, B
NON-INVESTMENT GRADE (Junk Bonds)	CCC, CC, C, D	Caa1, Caa2, Caa3, Ca, C	CCC, CC, C, D

JUST FOR INFO

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Management :

- The Credit Department has to set credit limits for each counterparties and periodically review them in order to limit the exposure in case of default
- The Credit limit (Dealing limit) is the maximum amount a trader is allowed to trade with a single counterparty
- Credit limits may be segmented by durations and products

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Example :

In case of default :

- the exposure on a cash trade is 100% of the nominal
- the exposure on a FRA trade is only limited to the interest rate on the notional amount
- the exposure on a FX swap is the cost of replacement which depends on the market conditions

► *as the exposure (risk) is not the same according to the financial instruments, it is logical to weight them accordingly in the credit limit allocation*

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SETTLEMENT, DELIVERY ("HERSTATT") RISK

Definition :

- The Settlement (delivery) risk is the risk that a counterpart doesn't deliver (security, cash, paper…) while the other party has already delivered (security, cash, paper…)

- Also known as the HERSTATT risk :

on the June 26, 1974, the German HERSTATT bank was closed at midday by the German central bank.

The result is that if HERSTATT has already taken receipt of payments made by European banks,

HERSTATT has not made yet the payments in USD to its counterparties in the United States.

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SETTLEMENT, DELIVERY ("HERSTATT") RISK

Example :

A EUR/USD FX swap where bank A Buys and Sells the EUR to bank B.

At maturity, bank A has already repaid the **EUR** back

but

bank B is unable to deliver the **USD** back to bank A.

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SETTLEMENT, DELIVERY ("HERSTATT") RISK

Management :

- This is typically a Credit risk problem and so, has to be managed accordingly (credit limits)
- It is good to know that the German HERSTATT bank closing is the real starting of the Credit risk concern among the banks

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Replacement Risk

Definition :

- In case of a counterparty default (partial or total), this is the risk to cover the now open position in the market at a loss
- Not only the positions that would be replaced at a loss have to be monitored but also those that would result in a profit : the counterparty may accept to close deals that are favorable for him (with a profit) and forget the others (so called "cherry picking")
- The replacement risk then apply to all the outstanding deals

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Example :

- Bank A buys a 3/6 EUR FRA at 3% from bank B
- The same day, bank A covers the position by selling a 3/6 EUR FRA to bank C at 3%
- After one month, bank B goes out of business and the price of the 2/5 EUR FRA is now 3.15%

► bank A is short at 3%, the market price is 3.15% : the cost of replacement is 0.15%

(please refer to the BACK OFFICE / DEFINITIONS : NETTING for more information about the replacement cost)

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Management :

- The problem arises from a counterparty default : this comes from a Credit risk
- It has to be managed on a mark to market basis : the bank has to know what is the Replacement risk on its outstanding trades

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Liquidity Risk

Definition :

- When holding an asset : the problem arises when it is not possible under current market situation to trade this asset (nobody wants it !!!)

- When funding a position : this is the ability for the bank to raise funds in the market. This is the Credit risk problem but now from the outside : what are the credit limits available on my name in the market ?

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Liquidity Risk

Management :

- As usual, carefully assessing investments is a strong point. Buying an asset which price may fall dramatically will make market participants to run away from it. Also, buying an asset in a very low volume market increases the liquidity concern.

- For the problem of funding, the bank needs to closely monitor its cash needs in order to make sure that sufficient funds are available in the market.

- In some countries, liquidity ratios (the ability to fund operations) are imposed. Also, the Central Bank may impose a Minimum Reserve Requirement : an amount of funds place by the bank at the Central Bank that represent a percentage of all the bank's liabilities

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Operational Risk

"The most significant operational losses have been larger in magnitude than the most significant market or credit losses"

Senior Federal Reserve Bank Official

Definition :

- The operational risk is defined by the International Convergence of Capital Measurement and Capital Standards (Basel II) as :

"the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events"

- This includes the Legal risk (change in the law that may affect a bank's position" but excludes the Strategic Risk (loss arising from a poor market decision : Market risk) and Reputation risk (weakening of a bank position following a loss, a trial,…)

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Operational Risk

The operational risks include :

- Errors : reporting, IT programming, mathematical modeling …

- Frauds : concealed losses, unauthorized trading activities, rogue trading (traders who want to take advantage of their job to make personal money), third party fraud…

- Failures : technology, lack of supervision, incomplete documentation…

- External events : Legal risk, Systemic risk (collapse of a financial system)…

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Operational Risk

Management : obviously difficult !!!

- Implementation of the Code of Conduct recommendations reduce the operational risk
- Implementation of Basel II and countries supervisory bodies recommendation
- Implementation of a value at risk approach for operational risk : takes into account the multiple variable that may affect the bank and assess the potential losses over a period of time

(please also refer to the last section of the risk environment chapter concerning BASEL II for this subject)

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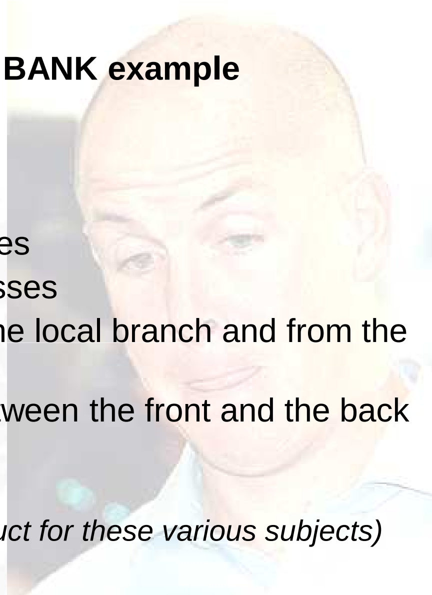

A final word : The BARINGS BANK example

Events :

- Unauthorized trading activities
- Concealed exposure and losses
- Lack of control : both from the local branch and from the London headquarters
- No segregation of duties between the front and the back office

(please refer to the Code of Conduct for these various subjects)

► Result : **BANKRUPTCY** !!!

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Definition :

- The Translation risk (also called Accounting exposure) results from rewriting the foreign currency statements (assets and liabilities) in terms of the parent's currency. The evolution of a foreign currency impacts the asset and liabilities expressed in this foreign currency and so the value of the balance sheet when translated in local currency

- This is not the same risk than the transaction (foreign exchange) exposure which applies to individual trades (often seen as Transaction risk for commercial companies and as Market risk for banks)

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Example :

An American company invests in the euro zone real-estate :

Caeteris Paribus,

a depreciation of the EUR/USD parity has a negative impact on its balance sheet

(it lowers the value of its EUR investment)

Translation Risk

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Management :

- Balancing the asset and liabilities in foreign currencies is a good (but difficult) way to manage the exposure : it is a sort of balance sheet hedge

- Hedging through foreign exchange tools, especially currency options (the risk is not as clearly identified as with a transaction exposure as it will be based on the future spot price)

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Definition :

- The Economic risk is the exposure of the competitiveness of a firm compared with foreign companies

- Unexpected changes in foreign currencies has a direct impact on the company ability to compete : it will impact
  - sales prices,
  - operating costs,
  - production costs…

- The level of impact will depend on the price elasticity of demand

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Management :

- Like for portfolio management, diversification is a way to reduce the economic risk. Diversification includes geographical operating diversification (the firm can face a negative evolution in one country and a positive one in another) and financing currencies diversification

- Again, as we are talking about unexpected evolution of currencies, currency options are a good tool to hedge against economic risk

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We will here analyse what are the kind of risks (according to the previous typology) attached to the financial instruments :

- We will consider that all instruments are subject to Market risks (evolution of the market) and Operational risks (error in pricing, reporting failure…)
- For each instruments, we will then see what are the :
  - Credit risk
  - Settlement risk
  - Replacement risk
  - Liquidity risk

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Cash loans :

Credit risk :	**YES** ⇒ 100% of the nominal, based on the borrower's name
Settlement risk :	NO
Replacement risk :	NO
Liquidity risk :	NO

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CD / CP :

Credit risk :	**YES** ⇒ 100% of the nominal, based on the issuer's name
Settlement risk :	NO
Replacement risk :	NO
Liquidity risk :	**YES** ⇒ maybe difficult to resell the paper before maturity (depends on the quality of the issuer and the market)

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REPOS :

Credit risk :	**YES** ⇒ depends on the collateral's name (if AAA government paper, the risk is quite low)
Settlement risk :	**YES** ⇒ the bank can send the paper back and not receive the cash from its counterparty
Replacement risk :	NO
Liquidity risk :	NO ⇒ If the collateral is a state paper (liquid markets) **which is generally the case**
	YES ⇒ depends on the issuer's name rating if not first grade investment security

Money Market

Summary :

	MONEY MARKET			
	CASH	CD/CP	T BILLS	REPOS
Credit risk	Yes	Yes	No ▲	Yes
Settlement risk	No	No	No	Yes
Replacement risk	No	No	No	No
Liquidity risk	No	▲	No ▲	No ▲

With :
- ▲: depends on different factors
- No ▲ : Generally not but may depends on some factors

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Money Market

T-BILLS :

Credit risk : NO ⇒ If the state issuing the Bill is AAA rated
YES ⇒ 100% of the nominal, based on the issuer's rating

Settlement risk : NO

Replacement risk : NO

Liquidity risk : NO ⇒ If the state issuing the Bill is AAA rated (liquid markets)
YES ⇒ depends on the issuer's name rating

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In this section, please also always keep in mind :

- The Transaction risk (for commercial companies)
so called the Market risk for banks

- The Translation risk

- The Economic risk

(please refer to the Risk Environment, Typology part for these risks)

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SPOT TRADES :

Credit risk :	NO
Settlement risk :	**YES** ⇒ Herstatt scenario
Replacement risk :	NO
Liquidity risk :	NO ⇒ if the currency is a major one **YES** ⇒ if the currency comes from an “exotic” country

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FORWARDS :

Credit risk :	**YES** ⇒ possible default before the maturity
Settlement risk :	**YES** ⇒ Herstatt scenario
Replacement risk :	**YES** ⇒ in case of default, need to book a new trade under the current market conditions
Liquidity risk :	NO ⇒ if the currency is a major one **YES** ⇒ if the currency comes from an “exotic” country

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FX SWAPS :

Credit risk :	**YES** ⇒ possible default before the maturity
Settlement risk :	**YES** ⇒ both at the start and at maturity
Replacement risk :	**YES** ⇒ in case of default, need to book a new trade under the current market conditions
Liquidity risk :	NO ⇒ if the currency is a major one **YES** ⇒ if the currency comes from an “exotic” country

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Summary :

	FOREIGN EXCHANGE MARKET		
	SPOT	FORWARD	FX XWAPS
Credit risk	No	Yes	Yes
Settlement risk	Yes	Yes	Yes
Replacement risk	No	Yes	Yes
Liquidity risk	▲	▲	▲

With :
- ▲: depends on different factors

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FORWARD RATE AGREEMENT :

Credit risk : **YES** ⇒ possible default at maturity and no cash payment on the settlement date

Settlement risk : NO ⇒ the risk is that the counterparty goes bankruptcy before settlement (highly unlikely that the counterparty goes bankruptcy on the settlement date)

Replacement risk : **YES** ⇒ in case of default before maturity, need to book a new trade under the current market conditions

Liquidity risk : NO ⇒ if the interest rate is a major one
YES ⇒ if the interest rate comes from an “exotic” country

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INTEREST RATE SWAPS :

Credit risk :	**YES** ⇒ possible default at any time
Settlement risk :	**YES** ⇒ a counterparty makes a payment for the fix or floating and the other one doesn't
Replacement risk :	**YES** ⇒ in case of default before maturity, need to book a new trade under the current market conditions
Liquidity risk :	NO ⇒ if the interest rate is a major one **YES** ⇒ if the interest rate comes from an "exotic" country

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OPTIONS (IN THE OTC MARKET) :

Credit risk :	**YES** ⇒ for the buyer of the option
Settlement risk :	**YES** ⇒ the option seller may be unable to deliver the underlying asset
Replacement risk :	**YES** ⇒ in case of default before maturity, need to book a new trade under the current market conditions
Liquidity risk :	NO ⇒ if the currency traded is a major one : there shouldn't be no problem to resell the option **YES** ⇒ if the currency traded comes from an "exotic" country

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FUTURES / OPTIONS : ORGANIZED MARKET

Credit risk : NO ⇒ If the trade is booked through an Exchange member (no Credit Risk with the Clearinghouse). The only loss may come from a trade booked with a non-Exchange member that holds the margin account : its bankruptcy would lead to the loss of the margin account.

Settlement risk : NO

Replacement risk : NO

Liquidity risk : NO

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Summary :

	DERIVATIVES			
	FRA	IRS	OTC OPTIONS	Futures/Options *
Credit risk	Yes	Yes	Yes	No ⚠
Settlement risk	No	Yes	Yes	No
Replacement risk	Yes	Yes	Yes	No
Liquidity risk	⚠	⚠	⚠	No

(* : traded on organized exchanges)

With :

- ⚠ : depends on different factors
- No ⚠ : Generally not but may depends on some factors

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Basel Committee

- The Basel Committee was founded in 1974 after the Herstatt bankruptcy : this was the first appearance of a systemic risk.
- The Basel Committee on Banking Supervision goal is to promote international standards to improve the soundness of the world's financial system
- The Basel Committee works under supervision of the "Central bank of the Central banks" :

  the Bank for International Settlements **(BIS)**

For the Certificate : no need to know extensively the work of the Committee but to have a good understanding of the recommendations and future regulations that will be implemented for risk management

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Basel Committee

The 4 main missions of the Committee are :

1- Improvement of security and reliability of the financial system

2- Implementation of control standards

3- Promotion of sound banking and supervisory practices

4- Promotion of international cooperation for prudential control

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THE COOKE RATIO (BASEL I)

- The first name of the Committee was the Cooke Committee (the first president was Peter Cooke, a Bank of England Director). The members were the central banks of the OECD (Organisation for Economic Co-operation and Development).

- In 1988, the Committee set the Cooke ratio ; it defined the notions of :

  •**Capital** : equity, reserves, part of subordinated debts

  •**Credit risks** : all the **credit exposure** of the bank (except credit with a maturity less than one year), taking into account some weights :

  – 50% for credits backed by mortgages

  – 20% for international organism, banking credits, non-OECD states

  – 0% for OECD states

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The ratio stated that :

$$\frac{\textbf{Capital}}{\textbf{Credit Risk exposure}} \mathbf{> 8\ \%}$$

This means that for

100 of credit granted by the bank,

8 has to be funded on its capital and
92 can be founded by other resources
(deposits, interbank funding…)

Basel Committee

The pitfalls of this ratio were :

- The nature of the credit risk : the main variable taken into account was the amount of credit and the quality of the counterparty was not taken into account with the precision needed.

- In the 90's, the off balance sheet activity soared and the Cook ratio was not suitable to face this new evolution. Even if in 1996, new recommendations were made for the coverage of off-balance sheet credit exposure, it was still not satisfactory.

Due to these factors, a new set of recommendations (Basel II) has been prepared and amended since 1998 and will be implemented in 2007 and 2008 (depending on the adoption of the lighter or heavier version by banks)

Basel Committee

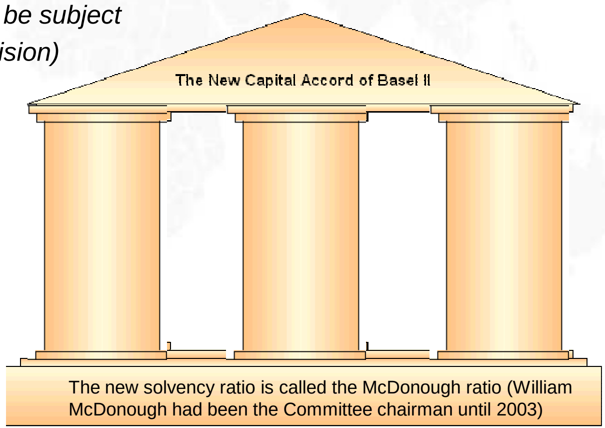
THE MCDONOUGH RATIO (BASEL II)

The Basel II recommendations are more ambitious than Basel I and consist in **three** pillars :

- Pillar 1 : Capital **Adequacy** versus three categories of risks
  (Credit, Market and Operational Risks)

- Pillar 2 : Capital Management **Supervision**
  (according to supervisors' decisions, the calculated capital adequacy in Pillar I may be subject to upward revision)

- Pillar 3 : Market **Discipline**



Basel Committee

As our focus is on risk management, we will mainly detail the first pillar

Pillar I : Presentation

- Unlike Basel I, Basel II takes into account the Market and operational risks

- So, we now have :

- As the Committee works under the "Bank for International Settlements" BIS 's supervision, the 8% is also called the BIS ratio

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Pillar I : Capital definition

The Capital definition is the eligible capital for risks coverage :

- **Tier I** (core capital) : Shareholder' equities, disclosed reserves and retained earnings. According to the BIS, 50% of the 8% capital requirement should be constituted of Tier I capital.

- **Tier II** (supplementary capital) : subordinated debt with a maturity greater than 5 years, undisclosed reserves, special securities (perpetual for example)

- **Tier III** : short-term subordinated debts for example. The use of Tier III is at the discretion of the national authority and the percentage used to support the market risk is strictly defined by the Basel Committee

It is important to notice that for Credit risk only Tier I and Tier II capital can be allocated ***(Tier III can be used for Market risks but not for Credit Risks)*** *: it leaves the terms of the 1988 Accord unchanged*

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Pillar I : Credit Risk Measurement

- Credit Risk Measurement : like in Basel I, it will be the credit amount weighted by the quality of the counterpart, but in a much more precise way
- Basel II takes into account the rating (standard and Poor's, Moody's…) of ALL the counterparts : states, banks, commercial companies…
- In Basel I, all the banks had a weight of 20% : it is not the case any more
- It is also possible for bank to use their own IRB method (Internal Ratings Based) : the bank assess the credit risk using its own model (this the "advanced approach" while using agency notations is the "standard approach")

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Pillar I : Credit Risk Measurement

Counterparty	Rating				
	AAA to AA-	A+ to A-	BBB+ TO BBB-	BB+ to B-	< B-
States	0%	20%	50%	100%	150%
Development banks	0%	20%	50%	100%	150%
Banks	20%	50%	100%	100%	150%
Companies	20%	50%	100%	100%	150%

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Pillar I : Market Risk Measurement

- The Market risk will measure the capital charges attached to trading books (please refer to the last part of the "Risk Environment" section for the definition of the trading book) : interest rates instruments, equities, FX and commodities

- The risk attached to each category of instrument will have to be assessed individually

- The global market risk will be assessed through :

• The specific risk : this is the risk arising from a change in price thanks to a change in rating of the counterparty (equities and interest rate risk products). For example, the specific risk for a AAA rated state is 0% but of 8% for a BB+ to B- rated state.

• The market risk in itself : this is the risk arising from a change in price thanks to a change in market conditions (all products)

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Pillar I : Market Risk Measurement

For the Market risk, banks may :

- Use a standard approach, as recommended by the Committee (like the risk evaluation based on a duration approach for interest rates products)

- Build their own models (it has to be validated by the regulation authority); banks have flexibility in building their models but the Committee set minimum standards :

• The risk will be assessed through the use of a 99% Value At Risk model, computed on a daily basis.
• The historical observation period is minimum one year
• Data must be updated no less frequently than once every three months…

(please refer to the Basel Committee Market Risk Amendment updated 2005 for further information at www.bis.org)

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Pillar I : Market Risk Measurement

Summary of capital requirements :

	Specific Risk capital charge	Market Risk capital charge
Interest Rate	Depends on ratings and positions maturities	Global calculation on the portfolio
Equities	8% of individual equity exposure *	8% of the net market exposure (long or short global position)
FX and Gold		8% of the overall net open positions** **
Commodities		15% of the net exposure by product

(: in case of liquid and well diversified portfolio, the specific risk will be 4%; the notions of "liquid and well diversified" will be defined by national authorities according to the local market characteristics)*

*(** : a 8% capital charge implies that the risk weight on the open positions is 100%)*

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Pillar I : Operational Risk Measurement

- As defined in the "Risk Typology : Operational risk" section, the operational risk has now to be taken into account by banks and capital has to be allocated to cover this kind of risk.

- There are two possible approaches :

• to follow the guidelines of Basel II : standard approach
• to build up its own internal model for operational risk measurement : advanced approach

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Pillar I : Operational Risk Measurement

Following the standard approach of Basel II implies to weight every business line by a percentage of risk in order to be able to determine the capital allocation :

Business Line	Weight
Corporate Finance	18%
Trading and Sales	18%
Retail Banking	12%
Commercial Banking	15%
Payment and Settlement	18%
Agency Services	15%
Asset Management	12%
Retail Brokerage	12%

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Pillar I : Operational Risk Measurement

- Building its own internal model for operational risk management : the **AMA** approach (*Advanced Measurement Approach*)

- Like market risk, it consists to build a 99% VAR model that will take into account operational loss experiences (on a historical basis). It includes element such as :

  - Systematic assessments of the processes
  - External environment
  - Internal operations ….

- This obviously hard to implement and manage : it consists in a quantitative approach (probability models for operational loss events and the potential size of the loss) but also integrates a part of qualitative assessments (like internal audit ratings of the quality of procedures)

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Pillar I : computation of the final ratio

The final ratio is the sum of the risks, but there is a need to create a numerical link between the three risks :

- **The credit risk** :
  the capital charge is based on the risk-weighted assets
- **The market risk** :
  the measure of market risk capital charge * **12.5** ***(1/ 8% = 12.5)***
  As the capital charge is calculated directly by the measurement systems, it is necessary to create a trading book notional risk weighted assets
  (to be able to compare it in the ratio with the credit risk)
- **The operational risk** :
  again the capital charge has to be * **12.5** to have a notional weighted assets
  (to be able to compare it in the ratio with the credit risk)

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Pillar I : computation of the final ratio

Example :

- Weighted risk assets for credit risk : 9.000
- Capital charge for market risk : 400 ► 400 * **12.5** = 5.000
- Capital charge for operational risk : 600 ► 600 * **12.5** = 7.500
- Capital available (taking into account eligible part of Tier I, II and III capital per risk category) : 2.190

So, the ratio is :

$$\frac{\overset{K}{2.190}}{\underset{CR\ +\ MR\ +\ OP}{9.000 + 5.000 + 7.500}} = 10.18\%$$

Basel Committee

Pillar II : Supervision

- This Pillar intend to enhance the power of the supervisors
- As banking strategies may change in term of asset allocation and risks, the central banks will have more freedom in establishing regulations for risk management
- They also will be able to increase capital requirements in some areas if they want to

Basel Committee

Pillar III: Market discipline

- Transparency rules are established for banking communication
- Banks will have to publish documents describing :
  - the measurement methods for capital requirements (this is a condition for using advanced measurement methods)
  - the risks and their management

Basel Committee

Conclusion

- The **deadlines** for Basel II were :
  - 2007 : for banks using the standard approaches
  - 2008 : for bank using advanced approaches

  (but the models used are always subject to the approval of the regulatory authority)

- Generally speaking , the Basel Committee recommends that banks use advanced approaches : internal models (if well built) are the best way to capture the specificity of each bank

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BASEL COMMITTEE : THE TRADING BOOK

Definition

- Instruments in trading book are subject to market risk and so require capital allocation in the BIS ratio

- A trading book consists in positions in financial instruments (cash or derivatives) and commodities held either for trading or in order to hedge other instruments of the trading book

- Trading positions may include position arising from proprietary trading, customer servicing or market making

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Composition

- Banks must have clear policies that determine which exposures have to be included in the trading book for calculating their regulatory capital

- The Committee has set minimum key points that bank must address when writing the procedures for trading book management (like exposures that can be marked-to-market daily by reference to an active market…)

- The Committee set also some basic requirements for positions eligible to receive trading book capital treatment (like clearly defined policy and procedures to monitor the positions, dealers have the autonomy to manage the positions…)

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This section is in three parts :

BACK OFFICE

We will define the role of the back office compared to the front office's one

DEFINITION

We will give a few definitions necessary for the Certificate

SETTLEMENT

We will explain the importance of the settlement and present the settlement systems

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The 5 usual responsibilities of the FRONT and MIDDLE office (the Treasury division) are mainly :

1- Asset and **L**iabilities **M**anagement **(ALM).**

To borrow at the lowest possible cost and
to invest at the highest possible level
in order to reach 2 objectives :

to maintain the bank liquidity (solvency) and
to maximize profits in investing the funds surplus.

2- Trading , arbitraging and hedging in all the financial products

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3- Coordination of the different books and positions
(on a worldwide basis for the largest banks)

4- Sales and marketing of financial products to the bank's clients

5- Risk control (middle office mainly) :
assessment of all the exposures (credit, market…)

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Back Office

The 7 usual responsibilities of the BACK office are mainly :

1- The input of deals

2- The verifications of the tickets trade details :

comparison between the dealer's ticket and
the confirmations made by the counterparty (brokers, banks…)

3- The checking of the Nostro accounts ("the reconciliation")
(please refer to the "DEFINITIONS" part below)

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4- The sending of deals confirmations to counterparties

5- The calculation of the amounts to be settled (OIS, FRA's…)

6- The payments of deals as long as the back office is certain that everything is correct

(please refer to the Settlement part below for more developments on this subject)

7- The investigation in case of trouble

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Back Office

As we can see, a few rules are essential :

- The strict segregation between the front and back office activities : the back office should not, in any case, be subordinated to the front office management and must have its own reporting line (remember the Barings case…)

- There is no profitable dealing room without an efficient and professionally organized Back Office

- As often seen , the Back Office is not only a cost center: through its control responsibility it can correct many front office errors.

(please refer also to the Model Code for Back Office topics)

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These are a few definitions necessary to know for the exam :

- Accounts : NOSTRO and VOSTRO
- Netting : Bilateral and Multilateral
- Reconciliation

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ACCOUNTS

The NOSTRO account ("**our**" account in Latin language) :

- Is the current **account** that a bank holds **with a foreign bank**
- Nostro accounts are usually in the currency of the foreign country
- Usually the foreign bank holding our account is our correspondent bank

(the Nostro account can also be called a "correspondent account")

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ACCOUNTS

The VOSTRO account ("**your**" account in Latin language) :

- Is the **account** serviced by a bank on behalf of an account owner bank : so, the account a correspondent bank holds for a foreign bank
- It is the counterpart of the Nostro account
- The Vostro account is also called the LORO account ("their" account in Latin language)

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ACCOUNTS

Example :

- Two correspondent banks are doing business in each other's country : Citibank (American bank) and Banco Santander (Spanish bank)*
  - Santander will hold a Vostro account, which belongs to Citibank in Euros; Citibank will hold a Vostro account, which belongs to Santander in USD.
  - Santander will hold a Nostro account in the USA with Citibank in USD; Citibank will hold a Nostro account in Spain with Santander in Euros.
- If Santander only have Citibank as a correspondent in the US, then all Santander's deals in USD will be processed through its Citibank Nostro account

(we are using those names for illustration only : pure imagination)*

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RECONCILIATION

The "Reconciliation" consists in :

- **Checking** if all receipts and **payments in a Nostro** account are similar to the information given by the correspondent bank
- As **all the cash transfers** (in and out) are kept in the bank's ledger, the responsibility of the back office is to check that the balance in the bank's ledger is equal to the balance given by the correspondent bank

This is a crucial job :

it may help to detect quickly any kind of problem
(transfer error, wrong settlement amount, back office's counterparty failure…)

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NETTING

- The netting of cash flows is <u>a way to reduce the credit exposure</u> with counterparties.
- Two main forms of netting exists
  (and are widely used in the derivative markets) :
  - Payment Netting
  - Closeout Netting
  - Netting by **Novation**

  (Transformation of a list of several old bilateral tickets into a sole contract)
- Netting can be bilateral or multilateral

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NETTING

- The **Payment netting** reduces the settlement risk
- If counterparties have to exchange multiple cask flows during a given day, they can agree to net those cash flows by one payment by currency
- The settlement risk is then reduced to the balance and is no more on the full amount to be exchanged

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NETTING

- The **Closeout netting** reduces the pre-settlement risk and represents the advantage to free credit limits through the closing of the credit exposure
- When counterparties have multiple offsetting obligations to one another (many IRS for example), they can agree to net these positions at a certain date
- The counterparties marked to market the positions and settle them with a net payment
- One of the advantage of Closeout netting is to avoid “cherry picking” : a counterparty makes a payment default but is still legally in its right to ask its counterparty to fulfill its obligations

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NETTING

- **Bilateral netting** : two counterparties agree to net with one another
- They sign a master agreement specifying the conditions of netting as well as the instruments which will be affected
- This kind of agreement is very common in the OTC derivatives markets

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NETTING

- **Multilateral netting** occurs between multiple counterparties.
- Usually easier when the counterparties belong to an exchange or a clearing system
- This is a way to share the credit risk : it reduces even more the credit exposure between participants then with bilateral netting because credit exposure to each participant is spread among all participants

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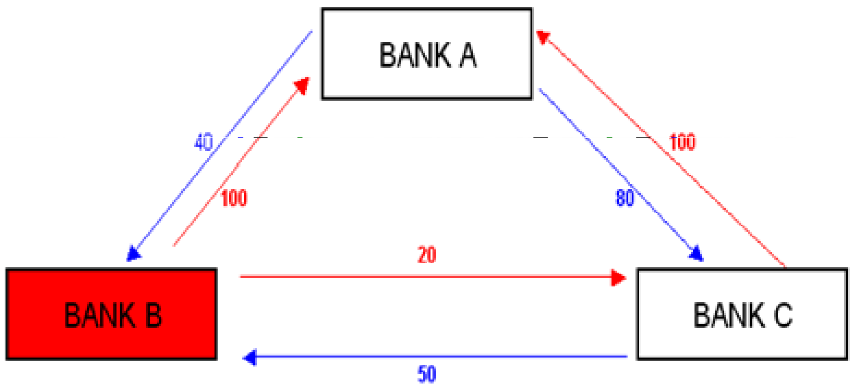
Some Definitions

Example of a no netting situation; we have the following settlements between three banks :



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Some Definitions

NETTING

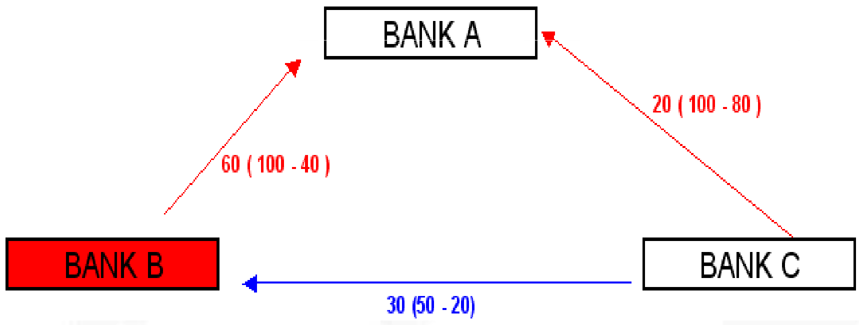
If Bank B goes bankruptcy, Banks A and C will face two problems :

- Bank B can “cherry pick” obligations = demanding payments while defaulting on its own obligations. Bank A will have to give 40 and C will have to give 50
- Bank A will have a replacement cost of 100 and Bank C of 20

Some Definitions

NETTING

Example of a bilateral netting; we have the following settlements between the three banks :



Some Definitions

NETTING

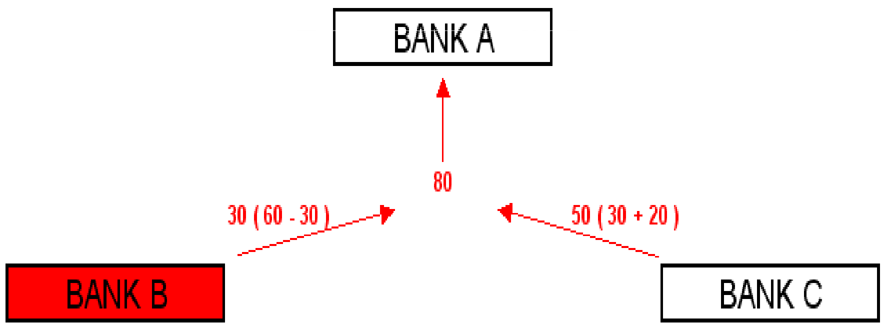
If Bank B goes bankruptcy :

- Bank A will have a replacement cost of only 60 (whereas it was 100 without netting)
- Bank C will have no replacement cost because Bank B owes it no net obligation (whereas it was 20 without netting)
- The problem of Bank C is still that Bank C can “cherry pick” but now only on 30 whereas it could have been on 50 without netting

Some Definitions

NETTING

Example of a multilateral netting; we have the following settlements between the three banks :



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Some Definitions

NETTING

If Bank B goes bankruptcy :

- Under multilateral netting, all parties' obligations are netted
- In case of default of the Bank B, the replacement cost would be of 30 and would be shared between Banks A and C
- The splitting of the replacement cost between A and C would depend of what has been arranged in the multilateral agreement

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Since the Herstatt bank default, banks have developed many systems to avoid the settlement risk

We will present here :

- The **S**tandard **S**ettlement **I**nstructions
- The **C**ontinuous **L**inked **S**ettlement system
- The different systems for cash clearing

Settlement and Clearing

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- The Standard Settlement Instructions (**SSI**) are bilateral agreements between two parties dealing together on a regular basis
- The agreement stipulates that counterparties have to use the same Nostro account while dealing in foreign currencies :
- This tends to avoid settlement mistakes from the back office : the back office always know where the counterparty's funds have to be paid
- Please notice that, when a SSI agreement exists, the traders, while entering the deal, have to clearly indicate if there is any exceptional change in the Nostro account where funds have to be delivered (the counterparty's back office should also make it very clear in their confirmations)

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- The Continuous Linked Settlement system (**CLS**) was created in 2002 by a number of the world's largest banks for the settlement of foreign exchange flows between themselves, their customers and other third-parties

- The CLS is a bank regulated by the New York Federal reserve. In 2006, the CLS has 56 members (shareholders) and 711 third-party institutions participating

- The CLS is today the market standard for FX settlement; in April 2006, its settles around 240.000 instructions a day in 15 currencies (average daily value of exceeding USD 2.5 trillion : this is about 98% of global FX trading…

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- The CLS is a multilateral netting system working on a "payment versus payment" basis

- Around only 3% of the gross-value instructions require aggregate pay-ins to CLS : so, for a gross-value amount of 1 trillion dollars, "only" 30 billions require aggregate pay-ins…

- When two parties enter a FX trades, each party sells (pays) one currency and buys (receives) another currency.

- CLS ensures that payments and receipts happen simultaneously : this annihilates the settlement risk

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Currencies traded by the CLS :

COUNTRY	CODE	CURRENCY
Australia	AUD	Australian Dollar
Canada	CAD	Canadian Dollar
Denmark	DKK	Danish Krone
Europe	EUR	Euro
United Kingdom	GBP	Pound Sterling
Hong Kong	HKD	HK Dollar
Japan	JPY	Japanese Yen
Republic of Korea	KRW	Korean Won
New Zealand	NZD	New Zealand Dollar
Norway	NOK	Norwegian Krone
Singapore	SGD	Singapore Dollar
South Africa	ZAR	South Africa Rand
Sweden	SEK	Swedish Krone
Switzerland	CHF	Swiss Franc
United States	USD	United States Dollar

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Among the main payment systems, we have :

- **TARGET** : the Trans-European Automated Real-time Gross settlement Express Transfer system. It manages the inter European Union Euro transfers

- **CHAPS** : the Clearing House Automated Payments System. It manages the electronic funds transfer in the UK

- **CHIPS** : the Clearing House Interbank Payment System. It manages the electronic funds transfer in the US

Settlement and Clearing

- To avoid settlement risks in our explosive growing trading world, a lot of other clearing and settlement market infrastructures have been developed
- As they are multilateral, they need a third party to provide secure messaging solutions
- The most important one is **SWIFT** (Society for Worldwide Interbank Financial Telecommunication)
- SWIFT is a worldwide banking solution to make electronic money transfers that cooperates closely with other clearing systems (like CLS for example)

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2. Cash Money Markets
3. Foreign Exchange
4. Forward-forwards, FRAs and Money Market Futures & Swaps
5. Options
6. Principles of Risk
7. The Model Code
8. Sundries

Model Code

The Model Code is a valuable guide to best conduct and international best practice for all market participants.

It is a practical study of over-the-counter market practices and conventions, distilled from the core best practices in the foreign exchange, money market and related derivative markets and is an integral part of the ACI suite of examinations

Model Code

Aim:

For candidates to have a thorough knowledge of the provisions of the Model Code and market practices,

with particular emphasis on high standards of integrity, conduct and professionalism

as well as the monitor and control mechanisms to be introduced to protect individuals and their institutions from undue risks and resultant losses.

Model Code

Aim:

Candidates will be expected to demonstrate an in depth knowledge and understanding of each of the following.

- the purpose of the Model Code, and its application within the industry
- managements' responsibilities with regards to monitor and control policies that must, could and should be considered to be introduced into their own institutions to ensure full compliance with the letter and spirit of the Model Code
- the roles and responsibilities of the back office and their relationship to the front office
- undesirable practices and unprofessional conduct issues highlighted in the Model Code
- market terminology
- the general risk management principles for dealing business
- the procedures for dispute resolution, mediation and expert determination
- the market practices covering dealings in

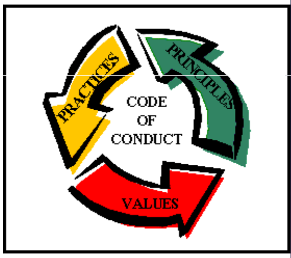
  • Foreign exchange
  • Money market
  • Derivatives
  • Dealer-broker relationships
  • Dealer-customer relationships

Model Code

Candidates should be able to:

- explain the purpose of The Model Code and its application within the industry
- describe the scope of The Model Code
- identify the role of the ACI's Committee for Professionalism as the author of The Model Code
- demonstrate a working knowledge of The Model Code by selecting the recommended responses to given issues as well as recognising what are appropriate standards of personal conduct in various circumstances, recommended dealing practice, the proper conduct and management of relationships with corporate/commercial clients and brokers, general risk management principles for dealing business and specific recommendations for the prudent organisation and management of such business
- explain standard market terminology
- explain the procedures for disputes, differences, mediation and compliance with The Model Code

Syllabus



Chap. I Business Hours and Time Zone Related
Chap. II Personal Conduct Issues
Chap. III Back Office, Payments and Confirmations
Chap. IV Disputes, Differences, Mediation and Compliance
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Chap. VI Brokers and Brokerage
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Chap. XI Market Terminology

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Appendix 2 Markets and Instruments covered by The Model Code
Appendix 3 Terms and Conditions for Financial Instruments
Appendix 4 Other Published Codes of Conduct and Approval for Translating
Appendix 5 The Charter of ACI - The Financial Markets Association
Appendix 6 SWIFT Curreny Codes

Model Code

For practical reason,

the "Model Code" is proposed

on a separated document

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Sundries

- Official ACI Formula
- ACI Cert. Examination Simulator
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Official ACI Formula

In all the formula:

- interest rates, yields, coupon rates and rates of discount are expressed as a decimal, eg 8.53% will be expressed as 0.0853
- 'annual basis' is the number of days in a year assumed under the appropriate rate convention
- 'term' is the number of days from settlement to maturity of the instrument in question
- day count' is the number of days from settlement to maturity of the instrument in question.

INTEREST RATE CONVERSIONS

Converting between annual bond basis and money market basis (Act/360)

$$\text{rate}_{\text{bond basis}} = \text{rate}_{\text{money market basis}} \frac{365}{360}$$

$$\text{rate}_{\text{money market basis}} = \text{rate}_{\text{bond basis}} \frac{360}{365}$$

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INTEREST RATE CONVERSIONS

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Converting between annually and semi-annually compounding frequencies

$$\text{rate}_{\text{annually-compounded}} = \left(1 + \frac{\text{rate}_{\text{semi-annually compounded}}}{2}\right)^2 - 1$$

$$\text{rate}_{\text{semi-annually compounded}} = \left(\sqrt{1 + \text{rate}_{\text{annually compounded}}} - 1\right)2$$

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Certificates of deposit

$$\text{proceeds at maturity} = \text{face value}\left(1 + \frac{\text{coupon x term}}{\text{annual basis}}\right)$$

$$\text{secondary market proceeds} = \frac{\text{proceeds at maturity}}{1 + \dfrac{\text{yield x day count}}{\text{annual basis}}}$$

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Discount-paying instruments quoted as a true yield

$$\text{secondary market proceeds} = \frac{\text{face value}}{1 + \dfrac{\text{yield x day count}}{\text{annual basis}}}$$

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OPTIONS

Discount-paying instruments quoted as a rate of discount

$$\text{discount amount} = \text{face value}\ \frac{\text{rate of discount x day count}}{\text{annual basis}}$$

$$\text{secondary market proceeds} = \text{face value}\left(1 - \frac{\text{rate of discount x day count}}{\text{annual basis}}\right)$$

$$\text{true yield} = \frac{\text{rate of discount}}{1 - \dfrac{\text{rate of discount x day count}}{\text{annual basis}}}$$

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MONEY MARKET

Forward price of sell/buy-back

$$\text{forward price} = \frac{(\text{repurchase price - accrued interest on collateral at termination})}{\text{nominal price of collateral}} 100$$

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$$\text{forward - forward rate} = \left[\frac{1+\dfrac{\text{interest rate}_{\text{long period}} \text{ x day count}_{\text{long period}}}{\text{annual basis}}}{1+\dfrac{\text{interest rate}_{\text{short period}} \text{ x day count}_{\text{short period}}}{\text{annual basis}}} - 1\right] \frac{\text{annual basis}}{\text{day count}_{\text{forward-forward period}}}$$

$$\text{FRA settlement amount} = \text{notional principal amount} \left(\frac{\dfrac{(\text{FRA rate - settlement rate}) \text{ x day count}}{\text{annual basis}}}{\left(1+\dfrac{\text{settlement rate x day count}}{\text{annual basis}}\right)}\right)$$

FIXED INCOME

Clean and dirty price of bond with annual coupons on coupon date

$$\text{price} = 100\left[\left(\frac{\text{coupon}}{\text{yield}}\left(1-\frac{1}{(1+\text{yield})^{\text{remaining coupons}}}\right)\right)+\frac{1}{(1+\text{yield})^{\text{remaining coupons}}}\right]$$

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FIXED INCOME

Dirty price of bond with annual coupons

$$\text{dirty price} = \frac{\text{first cashflow}}{(1+\text{yield})^{\frac{\text{days to next coupon}}{\text{annual basis}}}}+\frac{\text{second cashflow}}{(1+\text{yield})^{1+\frac{\text{days to next coupon}}{\text{annual basis}}}}+\cdots+\frac{\text{n}^{\text{th}}\text{ cashflow}}{(1+\text{yield})^{(\text{n-1})+\frac{\text{days to next coupon}}{\text{annual basis}}}}$$

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Duration at issue or on a coupon date

$$\text{Macaulay Duration} = \frac{\left[\begin{array}{l}(\text{present value of first coupon amount x time to first coupon}) + \\ \quad (\text{present value of second coupon amount x time to second coupon}) + \ldots \\ \qquad + (\text{present value of (last coupon amount} + \text{nominal amount) x time to last coupon})\end{array}\right]}{\text{net present value of bond}}$$

$$\text{Modified Duration} = \frac{\text{Macaulay Duration}}{\left(1 + \frac{\text{yield}}{\text{compounding frequency}}\right)}$$

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Calculating zero-coupon yield from an annual yield-to-maturity (bootstrapping)

$$\text{zero - coupon yield for n - year term}$$
$$= \left(\sqrt[n]{\frac{\text{final coupon amount} + \text{nominal amount}}{\text{implied present value of final coupon and nominal amount}}} - 1\right) 100$$

The implied present value of the final coupon and nominal amount is calculated by subtracting

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Forward FX rate

$$\text{forward rate} = \text{spot rate}\ \frac{1+\dfrac{\text{interest rate}_{\text{quoted currency}} \times \text{day count}}{\text{annual basis}_{\text{quoted currency}}}}{1+\dfrac{\text{interest rate}_{\text{base currency}} \times \text{day count}}{\text{annual basis}_{\text{base currency}}}}$$

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OPTIONS

Covered interest arbitrage

synthetic quoted currency interest rate =

$$\left[\left(\left(1+\frac{\text{interest rate}_{\text{base currency}} \times \text{day count}}{\text{annual basis}_{\text{base currency}}}\right)\frac{\text{forward rate}}{\text{spot rate}}\right)-1\right]\frac{\text{annual basis}_{\text{quoted currency}}}{\text{day count}}$$

synthetic base currency interest rate =

$$\left[\left(\left(1+\frac{\text{interest rate}_{\text{quoted currency}} \times \text{day count}}{\text{annual basis}_{\text{quoted currency}}}\right)\frac{\text{spot rate}}{\text{forward rate}}\right)-1\right]\frac{\text{annual basis}_{\text{base currency}}}{\text{day count}}$$

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Standard deviation

$$\text{standard deviation} = \sqrt{\frac{\sum_{t=1}^{n}(\text{return at time t} - \text{mean return})^2}{\text{number of observations} - 1}}$$

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Calculating the volatility over a period from annualised volatility

$$\text{volatility over period t} = \text{annualised volatility}\sqrt{t}$$

Where t is in years or fractions thereof.

ACI Cert. Examination Simulator

Dear Candidate :

Prior to starting your examination we would like you to assist us by answering a few simple questions. Your replies to these questions will help us in gaining a profile of our candidates and their chosen methods of training for our examinations.

1

ACI Cert. Examination Simulator

Enter the category of questions you want to answer :
This item proposes 9 questions about Personal conduct

00:29

5

Dealing for personal account : the management can ?

- (●) A Allow it without restrictions
- ( ) B Forbid it
- ( ) C Not interfere : it is each one's responsibility
- ( ) D None of these

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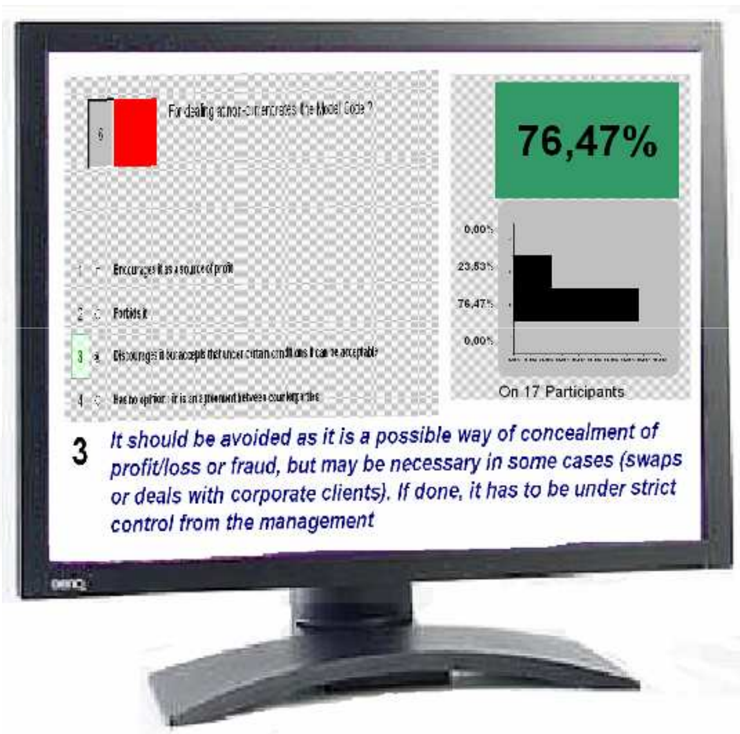

ACI Sample Questions

ACI Dealing Certificate
Sample Questions

Basic Interest Rate Calculations

1 A 3-month (91-day) deposit of EUR25 million is made at 3.25%. At maturity, it is rolled over three times at 3.55% for 90 days, 4.15% for 91 days and 4.19% for 89 days.
At the end of 12 months, how much is repaid (principal plus interest) ?

(a) EUR 25,962,011.01
(b) EUR 25,959,714.91
(c) EUR 25,948,878.47
(d) EUR 25,948,648.82

2 A 6-month (182-day) investment of CHF15.5 million yields a return of CHF100,000. What is the rate of return?

(a) 1.32%
(b) 1.29%
(c) 1.28%
(d) 0.65%

http://cfmx2003.w3line.fr/aciforex/docs/misc/SQ%20DEALING%20CERTIFICATE.pdf

ACI Sample Questions

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Sample Questions

Options

1 What is the name for an option which gives the holder the right but not the obligation to exercise the option on any one of a number of agreed periodic dates spread over the life of the option?

(a) European
(b) American
(c) Bermudan
(d) Asian

2 What are the components of the premium on an out-of-the-money option?

(a) intrinsic value + zero time value
(b) zero intrinsic value + zero time value
(c) zero intrinsic value + time value
(d) intrinsic value + time value

3 What does the rho of a currency option measure?

(a) sensitivity of the premium to changes in the delta
(b) sensitivity of the premium to changes in remaining time to maturity
(c) sensitivity of the premium to changes in interest rates
(d) sensitivity of the premium to change in the volatility of the underlying

ACI Sample Questions

ACI Dealing Certificate
Sample Questions

Foreign Exchange Calculations

1 Spot USD/CHF is quoted to you at 1.1250-55. If you sold CHF 15,000,000 at this quote, how many USD would you receive in exchange?

(a) USD 16,882,500.00
(b) USD 16,875,000.00
(c) USD 13,333,333.33
(d) USD 13,327,410.04

2 Spot EUR/USD is quoted at 1.0055-60 and spot GBP/USD at 1.5575-80. What is the EUR/GBP cross-rate?

(a) 0.6456-57
(b) 0.6454-59
(c) 1.5482-95
(d) 1.5661-73

3 Using the following rates, calculate the 6-month EUR/USD outright forward rate. Spot EUR/USD 1.1155 6-month (182-day) EUR deposits 3.25%
6-month (182-day) USD deposits 2.05%

(a) 1.1087
(b) 1.1088
(c) 1.1222
(d) 1.1223

ACI Sample Questions

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Sample Questions

Principles of Risk

1 What is a ‘vostro’ account?

(a) your account in a foreign currency with another bank
(b) your account in domestic currency with another bank
(c) an account held with your bank by another in a foreign currency
(d) an account held with your bank by another in your currency

2 Which risks are increased by taking collateral?

(a) operational risk
(b) legal risk
(c) liquidity risk
(d) all of the above

3 What is the purpose of risk capital?

(a) to pay for expected losses
(b) to pay for unexpected losses
(c) to meet reserve requirements
(d) to fund proprietary trading

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Jean-Pierre DOUMONT

Mr Jean-Pierre DOUMONT

Activities : Up to 2002, as Director of Carl Kliem S.A., a European financial services and brokerage provider, Mr Doumont has shared accountability for the development, education and management of the Firm and its individual sectors. Also working from the Belgian Branch, he was tasked with a broad scope of the business activities, Mr Doumont, who has been providing his ingenuity and professional expertise to Carl Kliem S.A. for more than two decades, is currently working in freelance consulting, in particular for the A.T.T.F. Luxembourg and manages a consulting and investment company. He also participates at development projects of a consultancy company “Consultis S.A” Luxembourg as Associated Partner.

Career Steps : Doumart Consulting S.A. Luxembourg : Managing Director, Official Senior Expert (present). 2002 Carl Kliem S.A. : Administrator-Director (1999), Director (1995), Deputy-Director (1991)

Education : Master in Economic Sciences Universities FNDP Namur and UCL LLN

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David MISSENARD
1967-2008

Mr David MISSENARD

Activities : Until 1996, Mr.Missenard worked as a trader for two major banking institutions (BNP Paribas and Barclays capital market). His activities were oriented towards position management, trading and arbitrage among derivatives products. During this period, Mr.Missenard also developed his own real-time arbitrage software application. Between 1996-2000, Mr.Missenard was the chairman of an Air-Conditioning and Heating company in France. Since seizing the opportunity of selling the company, Mr.Missenard has set up an investment holding in Luxembourg and and has also been working as advising consultant for start-up businesses. Mr Missenard, who presented this preparation course together with Mr Doumont for 2 years, died prematurely at the age of 41 in October 2008.

Career steps : Serid Luxembourg : Director; Official Senior Expert (2008). Missenard-Quint Entreprise, chairman (1996-2000); Barclays capital market, senior trader (1994-1996); BNP Paribas, trader (1991-1994)

Education : Master in Market Finance (Paris Graduate school of business, ESCP, 1991); Master in Business Administration (University of Hartford, USA, major : corporate finance, 1990); Bachelor in Company Management (Ecole Superieure des Dirigeants d'Entreprise - Paris, major : accounting, 1989)

FAQ

Q1. How often will the ACI examinations be delivered?
A. The examinations are available daily.

Q2. How can I register for the Examinations?
A. The examinations are delivered, on behalf of ACI, by Prometric via its network of over 2,000 worldwide testing centres. Registration is made directly with Prometric and details of the regional telephone numbers for registration are available on the ACI website.

Q3. If I don't have Internet access, how can I get the registration information?
A. You can obtain the information by contacting either your National Association or by calling ACI directly on the following number:
ACI Paris: (33) 1 42975115 or Email: deputymanager@aciforex.com

Q4. How long after registering will I be able to take the examination?
A. The time delay between registration and taking the examination will be based solely on the workload of the chosen Prometric test centre. However you should be able to take the examination within a week to ten days of registration at the very most.

Q5. What should I do if I encounter a difficulty at the Prometric test centre regarding my exam?
A. Your ACI examination is downloaded overnight to the Prometric test centre where you have booked your examination. On the day, if you encounter any problem concerning your examination, ask the test centre to telephone Prometric and report the problem. If the difficulty remains unresolved contact ACI's Education Department (33) 1 42975115

Q6. How difficult is it to use the PC to take the examination?
A. No special computer skills are required. Assuming you know how to use a PC mouse to move the on-screen cursor you will find the system very easy to operate. You will also be given a 15-minute tutorial, prior to the examination, on how to use the system.

FAQ

Q7. Where can I obtain a copy of the Formulae Sheet?

A. All training companies should have a supply of these. In addition you can obtain a copy from your National Association or from the ACI contact previously listed. A copy may also be downloaded from ACI's website.
All main Prometric test centres will also have a supply of Formulae Sheets and an 'on-screen' version is available on the test screen.

Q8. What calculator will I use?

A. The ACI International Examination Board have approved the use of the following calculators:
HP12C, HP17B or HP19B, or any hand held calculator without programmable (text) capability, such as a Casio. The Microsoft 'on-screen' calculator is available on the test screen.

Q9. How long will I need to wait to get my examination result?

A. You will receive your final result immediately you have completed the examination. In addition you will receive detailed feedback on your scores in each of the topic areas covered by the syllabus.

Q10. Will I receive an official certificate?

A. Successful candidates will receive written confirmation of their result at the Prometric test centre. A formal Certificate will be dispatched to them later, either directly by ACI or via their national association.

Q11. If I am unfortunate enough to fail, how long do I need to wait to be able to re-sit the examination?

A. You can register and re-sit the examination as soon as you feel competent to do so. The detailed feedback you receive should make it easier for you to revise those areas where your score was below the required pass level

FAQ

Q12. What is the format of the ACI Diploma?

A. The ACI Diploma is a multiple choice question paper. Information on the structure of this examination available on ACI's website.

Q13. Do the answers to the calculations questions in the ACI Diploma need to be 100% correct?

A. Answers to the calculations questions must be 100% correct.

Q14. Can I request a blank sheet of paper to work out calculations?

A. Prometric Test Centres will provide each candidate with a wipeable white board for workings. Blank sheets of paper are no longer available.

Q15. What percentage is required for a Pass, Merit & Distinction?

A. Refer to our first slides

LUXEMBOURG

FAQ

Q16. Why are Repos included in the ACI Dealing Certificate?

A. The Board of Education considers that Repos are now a pivotal instrument in the international money market and most (but not all) domestic money markets. The repo markets are massive and growing rapidly. The importance of repos is being increased by the pressure being placed on banks by regulatory capital requirements and economic capital constraints to switch from unsecured financing. An examination for dealers working in the modern, global money markets that did not include repos would not be credible. Dealers in domestic markets which do not trade repos need to be aware of the international dimension and position themselves for the eventual introduction of repos into their own market.

Q17. What does 'Principles of Risk' refer to?

A. The management of risk is what dealing is all about. The Dealing Certificate introduces candidates to the subject, in particular, to the main types of risk, basic risk measurement and important ways of mitigating and controlling risk. Risk measurement covers only the market risk on spot FX positions.

Q18. Do I need to be a member of ACI to take the examinations?

A. Not at all. ACI's examinations are open to everyone be they members of ACI or not. However we do naturally encourage all candidates to join their local national association or, should this not exist, take up individual membership of ACI.

Q19. Are there any exemptions in place that I should be aware of?

A. An exemption exists between ACI and the Securities Institute. More information on this can be found on ACI's website.

Q20. May I take a language dictionary into the test centre with me - eg English/ French?

A. Yes, the use of a language dictionary is permitted.

LUXEMBOURG

BIBLIOGRAPHY

Sundries
BIBLIOGRAPHY

BOOKS

In English

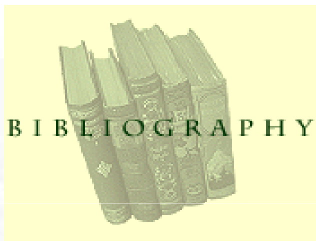
In French

ARTICLES

WEBSITE

BOOKS :

In English :



Options Markets, Cox / Rubinstein, Prentice-Hall
Principles of Corporate Finance, Brealey / Myers, Mc Graw Hill
Futures Markets, Kolb, NYIF
Option Market Making, Baird, Wiley Finance Edition
The options advantage, Caplan, Probus Publishing
Managerial Economics, McGuigan / Moyer, West
Case problems in finance, Butters / Fruhan / Mullins / Piper, IRWIN
Multinational business finance, Eiteman/Stonehill, ADDISON WESLEY
Mastering the ACI dealing certificate, Parker, Prentice Hall
Value-at-Risk, Holton, Elsevier Academic Press
Mastering financial calculations, Steiner, Prentice Hall
Mastering value at risk, Butler, Prentice Hall

In French :

Les taux d'intérêts (Interest rates), Rassi / Mercier / Goulaouen, ESKA
Les Options sur taux d'intérêt (Interest rate options), Augros, Economica
Les options de change, (FX options), Lombard / Marteau, ESKA
Les obligations à coupon Zéro (0 coupon bonds), Clermont-Tonnerre / Lévy, Economica
Les marchés à terme d'instruments financiers (Future financial markets), Lubochinsky / Marteau, ESKA
Marché et gestion obligataire (bond market and bond management), Rassi / Mercier / Hérouard, ESKA
Les swaps, Anastassiades / Parant, ESKA
Les swap, Chazot / Claude, Economica
Produits des Marchés Monétaires Jean-Pierre Doumont CKL
Marchés Financiers, gestion de portefeuille et des risques (Financial markets : Portfolio and risk management), Jacquillat / Solnik
Gestion du risque de taux d'intérêt (Interest rate risk management), De La Baume, Economica
Mathématiques des marchés financiers (Financial markets mathematics), Dalbarade, ESKA

BIBLIOGRAPHY

ARTICLES

Interest rate options, options Workshop, Nielsen, November 1992
Operational Risk Management, Basel committee, September 1998
Market risk amendment updated 2005, Basel committee

WEBSITES

www.bis.org
en.wikipedia.org
www.riskglossary.com
www.gloriamundi.org
www.cls-group.com
www.lbma.org.uk
www.imf.org
www.acinet.com
www.bankofengland.co.uk
www.lme.co.uk
www.lppm.org.uk
http://users.skynet.be/webpage/sem