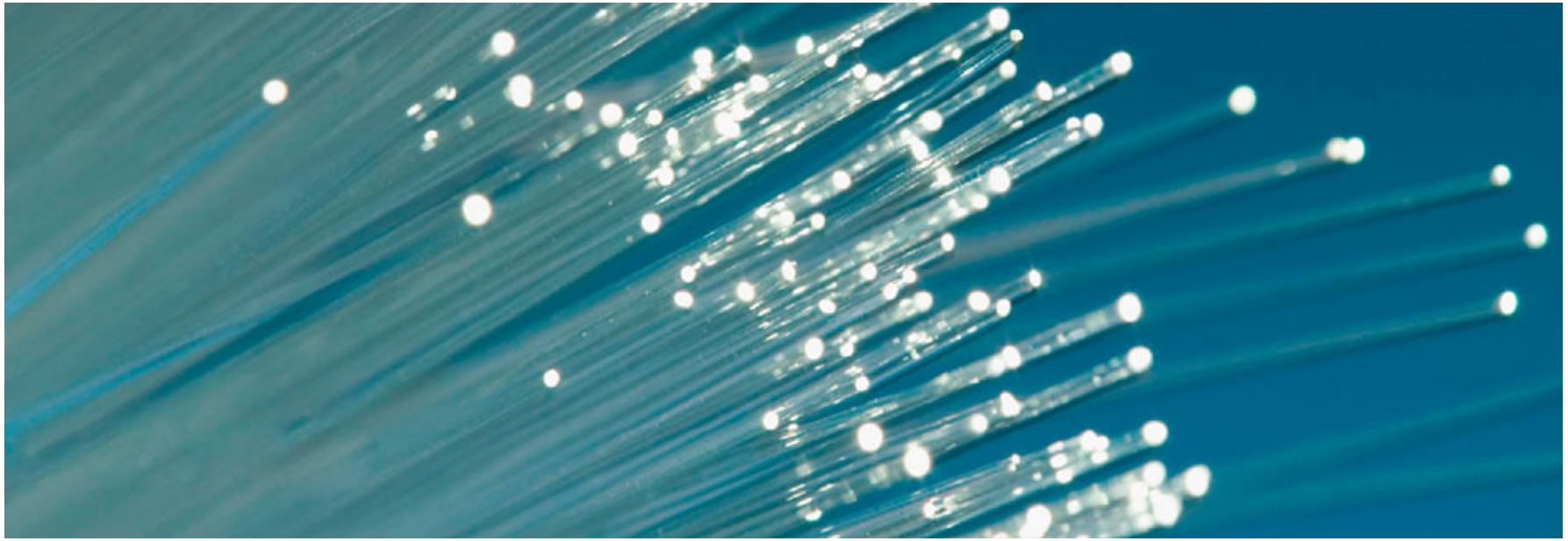


Kondor+
Basic Course

Eleonore Charrez

Risk Learning

THOMSON REUTERS

Emanuel Derman

- Physics PhD
- globally revered financial expert
- former top Goldman Sachs executive
- professor at Columbia University,
- a leading "quant" having spent a big chunk
- of his professional life trying to determine whether the markets are mathematically tamable:

"It's not that physics is better, but rather that finance is harder. In physics you are playing against God, and He doesn't change His laws very often. In finance, you are playing against God's creatures, agents who value assets based on their ephemeral opinions."

Emanuel Derman

"No mathematical model can capture the intricacies of human psychology. Watching people put too much faith in the power of formalism and mathematics, I saw that if you listen to the models' siren song for too long, you may end up on the rocks or in the whirlpool."

Emanuel Derman

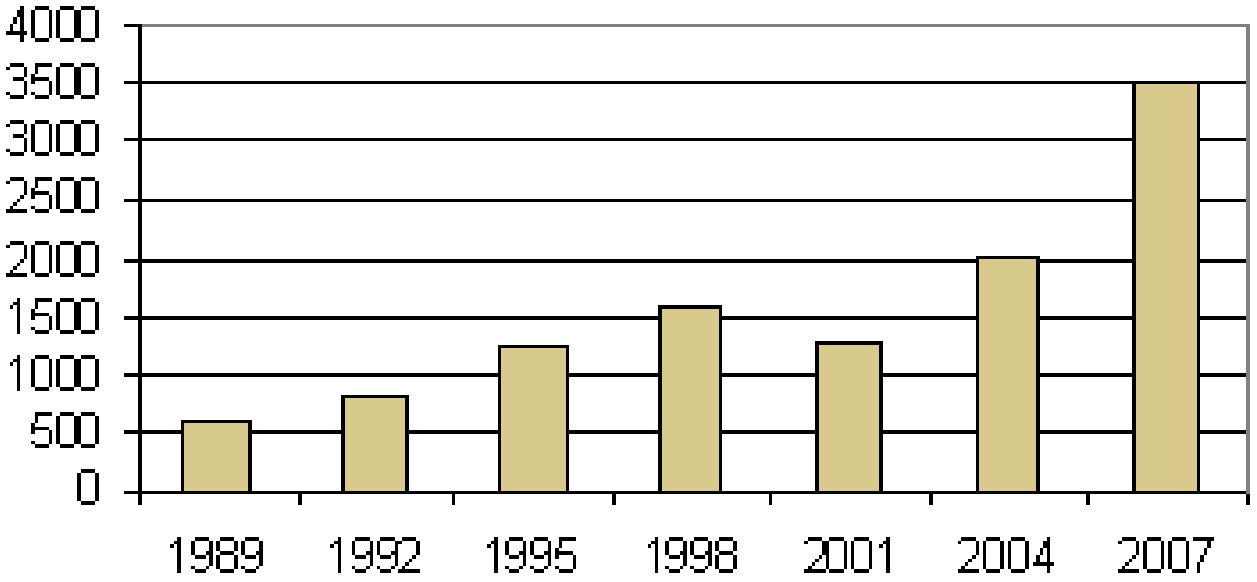
"As a physicist, when you propose a model of Nature, you are pretending you can guess the structure created by God. Perhaps it is possible because God doesn't pretend. But as a quant, when you propose a new model of value, you are pretending you can guess the structure created by other people. As you say that to yourself, if you are honest, your heart sinks. You are just a poor pretender and you know immediately there is no chance at all that you are truly right. When you take on other people, you are pretending you can comprehend other pretenders, a much more difficult task."

John Meriwhether, LTCM

"The hurricane is not more or less likely to hit because hurricane insurance has been written. In financial markets this is not true. The more people write financial insurance, the more likely it is that disaster will happen because the people who know you have sold the insurance can make it happen".

FX Spot

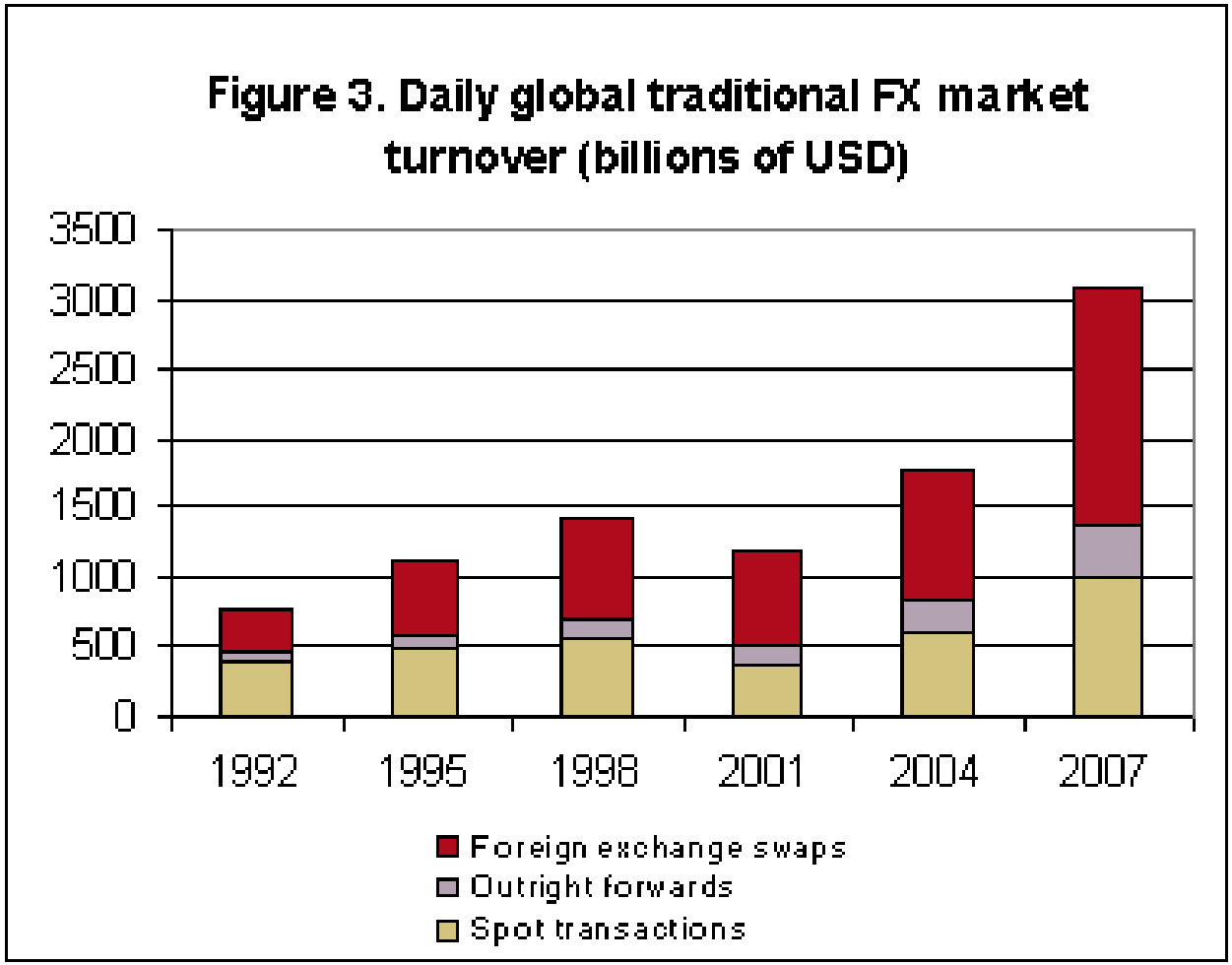
Figure 1. Global aggregate daily FX turnover by BIS* (billions of USD)



Data for 1989 and 1992 include only **spot, forward and FX swaps**, not options or cross-currency interest rate swaps.

Source: BIS : Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity

Daily FX Market transactions



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Source: BIS : Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity

FX Spot

- USD 2+ trillion per day
- Major Currencies : USD, EUR, CHF, …
- Direct & Indirect Quote

- A **direct quote** is when THE US Dollar is the base currency (majority of currencies)

- An **indirect quote** is when the USD is the quoted currency (the exceptions) EUR, GBP, AUD, NZD (and most UK ex-colonies)

Kondor + Ccy set up – required steps

- Geographical Area definition
- Country Definition
- City Definition
- Holiday Calendar definition
- New Ccy record insertion
- New Ccy Pairs market convention set-up
- Set-up the Forex Base Rates, if used
- Points definitions, if new pair is swap pair
- Volatilities definitions, if new pair is option pair
- Realtime link of new Ccy pair, points and volatilities
- Yield curve definition
- Calculation Parameters

Revaluation

You run revaluations to determine your breakeven price for tomorrow. Revaluation results and reports display profit or loss in the local currency that results from the insertion of deals since the previous revaluation.

(Administration Guide p. 143)

Yield curve structure - theories

- **Expectation hypothesis :** if higher interests are expected investors invest in short term paper. Theory for basis of forward rates.

- **Liquidity Preference** : Liquidity premium for long term paper (theory can't explain inverse yield curves…).

- **Market segmentation theory :** each market segment is independent and market participants only participate in one segment (theory explains humps on yield curve).

Calibration Instruments

- **US government short curve** : T-bills, FRAs, swaps and liquid coupon bearing bonds in the AA rating category.

- **UK government curves** : UK government bonds (*gilts*), gilt sale and repurchase transactions (*gilt repos*), interbank loans, short sterling futures, FRAs and swaps.

- **LIBOR yield curve**

➔ combination of spot LIBOR rates, FRAs, IR futures and swap rates.
  - 1-month to 12-month LIBOR rates to estimate the short end of the curve. But LIBOR rates are not available for maturities longer than 1 year ➔
  - for the medium and long IR Futures, FRAs and/or swaps.

Note : There are many combinations of bonds, futures, FRAs and swaps that can be used to construct a yield curve. Of course, if the data were perfect and markets were arbitrage free, the choice of instruments should not matter. However, given the inevitable noise in market data, the choice of securities *does* have an impact on the shape of the yield curve.

Zero Curve – Technical Details

Zero Curves generally use :

- cash BAs/LIBOR out to 3 months
- interpolate from the futures strip from 3 months out to 1 year
- benchmark bond + swap spread thereafter (2, 3, 4, 5, 7, 10, … years)

- as of 1 year, the semiannual par swap rates are linearly interpolated
- discount factors are bootstrapped to *exact* swap curve dates, allowing for unequal periods (due to weekends and/or holidays)
- continuously compounded zero rates are derived from discount factors at bootstrap dates
- rates at arbitrary dates are linearly interpolated

Bootstrapping

= iterative coupon stripping technique to obtain zero coupon yields, i.e. the zero curve.

problem with **bootstrapping** :

- even a small amount of noise in securities prices can result in large spikes in the forward curve, especially at longer maturities

➔ if the yield curve is to be used to make inferences on the volatility and correlation structure of interest rates it is better not to derive the yield curve using the bootstrap technique, but **semi-parametric** and **parametric models** (Nelson, Siegel, Svensson) **for yield curve fitting** (used by the Bank of England, the European Central Bank and the US Federal Reserve)

BOOTSTRAP METHODOLOGY - Kondor

1. Use of deposit and swap rates as market rates.
2. Computation of discount factors with bootstrapping method.
3. Determination of the zero coupon yield curve.
4. Determination of the implied par curve.

& DF p. 26 & 27… (Curves Guide)

Source : Kondor+ 3.0 Curves Guide p.24

Zero Curve – Formulas

1. Cash BA/LIBOR discount factors:

$$DF_{days} = \Big/ \left(1 + \frac{r}{100} \cdot \frac{days}{DC}\right)$$

r = money market rate in percent form
days = actual days between valuation and maturity
DC = day count convention (actual 360 or 365)

Zero Curve – Formulas

2. Cash BA/LIBOR discount factors are converted to continuous compounded zero rates:

$$r_i = -\left(\frac{365}{days}\right) \cdot \ln\left(DF_i\right)$$

Zero Curve – Formulas

3. Cash BA/LIBOR rate at the nearest futures contract date is linearly interpolated from the continuous rates computed in 2. above. The discount factor at this date is then computed using:

$$DF_{start} = e^{-r_{start} \cdot days/365}$$

Zero Curve – Formulas

4. Discount factors out along the futures strip are computed recursively using:

$$DF_{end} = DF_{begin} \Big/ \left(1 + \frac{F}{100} \cdot \frac{days}{DC}\right)$$

DFend = discount factor at the end of the contract in question
DFbegin = discount factor at the beginning of the contract
F = forward rate implied in the futures price = (100 - futures price)
days = actual days covered by the futures contract

Continuously compounded zero rates are derived from these discount factors using the formula in 2..

Zero Curve – Formulas

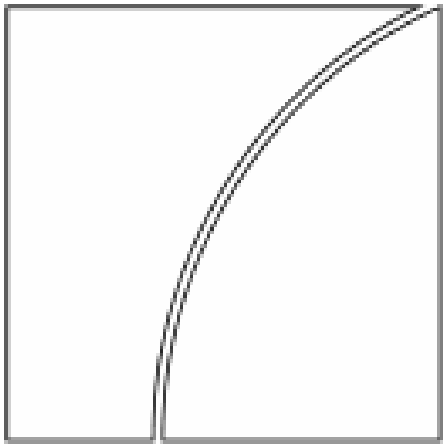
5. Discount factors out along the bond + swap spread strip (1 or 2 years + (depending on the currencies / countries / liquidity / …) are computed recursively to exact dates in half year increments using:

$$DF_i = \left(1 - R_i \cdot CDF_{i-0.5}\right) \Big/ \left(1 + R_i \cdot \frac{days_i}{DC}\right)$$

DFi = discount factor at year i
Ri = par all-in swap rate at year i
CDFi-0.5 = cumulative discount factor to the previous swap date

Zero Curve - studies

BANK FOR INTERNATIONAL SETTLEMENTS



BIS Papers
No 25

Zero-coupon yield curves:
technical documentation

Monetary and Economic Department

October 2005

THOMSON REUTERS

http://www.bis.org/publ/bppdf/bispap25.pdf?noframes=1

Yield Curves – Kondor+

Bond Curve Estimator

Bond Sample: BUND BUNDESANLEIHEN

Calculation Method: Vasiceck and Fong

Bond	Bond Name	Maturity Date	Estimated Price	Market Price	Yield to Maturity	Difference Of Prices	Standard Deviation	Student Test
DE113512	BUND 113512 4.5 04/07/09	04/07/2009	101.25	101.25	0.741519	0.001	0.064	0.01
DE113513	BUND 113513 5.375 04/01/10	04/01/2010	103.71	103.71	0.957257	-0.004	0.157	-0.03
DE113515	BUND 113515 5.25 04/07/10	04/07/2010	105.44	105.43	1.143388	0.005	0.249	0.02
DE113516	BUND 113516 5.25 04/01/11	04/01/2011	107.14	107.13	1.307714	0.009	0.341	0.03
DE113521	BUND 4.5% 04-JAN-2013 EUR	04/01/2013	106.15	106.62	2.662011	-0.477	0.660	-0.72
DE113531	BUND 3.750% 04-JAN-17 EUR	04/01/2014	101.76	101.05	3.348037	0.707	0.467	1.51
DE113526	BUND 3.75% 04-JAN-2015 EUR	04/01/2015	104.31	107.21	2.411550	-2.898	0.986	-2.94
DE113530	BUND/ DEGV 4.000 04-JUL-16	04/07/2015	107.73	108.29	2.564269	-0.554	1.065	-0.52
DE113528	BUND/DEGV 3.250 04 -JUL- 15	04/07/2015	103.40	104.04	2.550942	-0.632	1.039	-0.61
TRIL-BND2016	TRIL 3.5% 4-JAN-2016 EUR	04/01/2016	106.40	105.17	2.662532	1.227	1.117	1.10
DE113534	BUND 4.00 4 JAN 2018 EUR	04/01/2017	110.47	108.82	2.734483	1.654	1.287	1.29
DE113533	BUND DEGV 4.25% 04 JUL 17 EUR	04/07/2017	111.81	110.30	2.843139	1.503	1.365	1.10
DE113535	BUND 4.25% 4-JUL-2018 EUR	04/07/2018	109.97	110.73	2.919272	-0.756	1.506	-0.50
TRIL-BND2019	TRIL 3.75% 4-JAN-2019 EUR	04/01/2019	104.65	106.38	2.991867	-1.728	1.532	-1.13
DE113508	BUND 113508 4.75 04/07/28	04/07/2028	111.80	110.74	3.886795	1.057	2.542	0.42
DE113527	BUND 4.0% +JAN-2037 EUR	04/01/2037	103.92	103.30	3.805416	0.625	3.044	0.21
DE113532	BUND 4.25% 4-JUL-2039EUR	04/07/2039	109.01	109.94	3.698755	-0.922	3.381	-0.27
DE113536	BUND 4.75% 4-JUL-2040 EUR	04/07/2040	118.45	119.07	3.709747	-0.618	3.643	-0.17

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Vasiceck-Fong

Tenor	Yield
1Y	1.0228
2Y	1.3701
3Y	1.9069
4Y	3.0040
5Y	3.4253
6Y	2.8738
7Y	2.4205
8Y	2.5376
9Y	2.9315
10Y	3.3456
11Y	3.6511
12Y	3.8563
13Y	3.9886
14Y	4.0683
15Y	4.1099
16Y	4.1246
17Y	4.1203
18Y	4.1033
19Y	4.0780
20Y	4.0478
21Y	4.0152
22Y	3.9819
23Y	3.9491
24Y	3.9178
25Y	3.8885
26Y	3.8615
27Y	3.8372
28Y	3.8155
29Y	3.7965
30Y	3.7801

Cluster Bootstrap

Tenor	Yield
1M	0.7632
2M	0.7862
3M	0.8084
4M	0.8329
5M	0.8537
6M	0.8766
7M	0.9003
8M	0.9218
9M	0.9448
10M	0.9678
11M	0.9900
1Y	1.0123
2Y	1.3879
3Y	2.0004
4Y	2.8466
5Y	3.4265
6Y	3.0566
7Y	2.5275
8Y	2.4851
9Y	2.7767
11Y	3.4479
12Y	3.6901
13Y	3.8764
14Y	4.0036
15Y	4.0845
16Y	4.1236
17Y	4.1309
18Y	4.1151
19Y	4.0862
20Y	4.0531
21Y	4.0192
22Y	3.9838
23Y	3.9472
24Y	3.9096
25Y	3.8701
26Y	3.8306
27Y	3.7906
28Y	3.7496
29Y	3.7092
30Y	3.6916

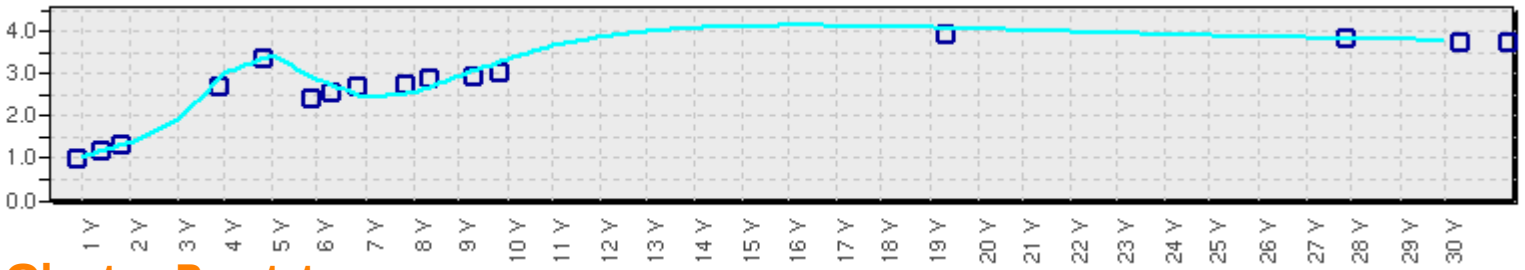
Iterative Bootstrap

Tenor	Yield
1M	0.7519
2M	0.7519
3M	0.7519
4M	0.7519
5M	0.7790
6M	0.8156
7M	0.8534
8M	0.8877
9M	0.9243
10M	0.9609
11M	0.9938
1Y	1.0259
2Y	1.4370
3Y	2.1283
4Y	3.2885
5Y	5.9302
6Y	2.3650
7Y	2.6233
8Y	2.7292
9Y	2.8756
11Y	3.1530
12Y	3.2859
13Y	3.4196
14Y	3.5521
15Y	3.6851
16Y	3.8183
17Y	3.9513
18Y	4.0838
19Y	4.2174
20Y	4.2357
21Y	4.1928
22Y	4.1500
23Y	4.1071
24Y	4.0639
25Y	4.0212
26Y	3.9783
27Y	3.9354
28Y	3.8864
29Y	3.8032
30Y	3.7194

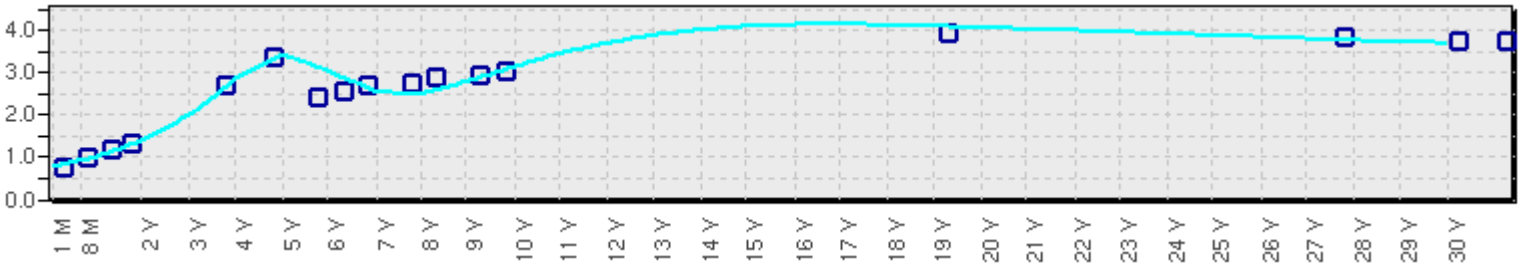
Linear Time-splines

Tenor	Yield
1M	2.6376
2M	2.6376
3M	2.6376
4M	2.6376
5M	2.6376
6M	2.6376
7M	2.6376
8M	2.6376
9M	2.6376
10M	2.6376
11M	2.6376
1Y	2.6376
2Y	2.6376
3Y	2.6376
4Y	2.6376
5Y	2.6376
6Y	2.6376
7Y	2.6376
8Y	2.6376
9Y	2.6376
11Y	2.6376
12Y	2.6376
13Y	2.6376
14Y	2.6376
15Y	2.6376
16Y	2.6376
17Y	2.6376
18Y	2.6376
19Y	2.6376
20Y	3.1629
21Y	3.7770
22Y	4.1876
23Y	4.4264
24Y	4.5256
25Y	4.5162
26Y	4.4310
27Y	4.3017
28Y	4.1597
29Y	4.0381
30Y	3.9675

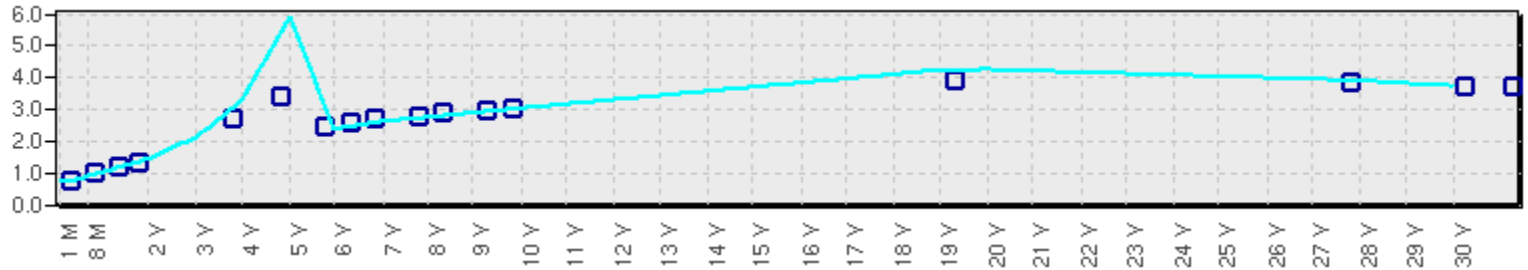
Vasiceck-Fong



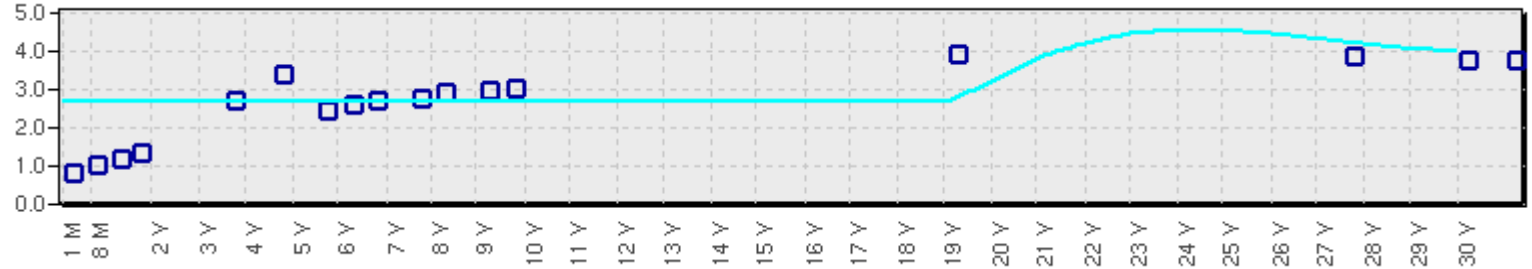
Cluster Bootstrap



Iterative Bootstrap



Linear Time-splines



NEWTON RAPHSON METHODOLOGY

Kondor+ uses a sophisticated implementation of the Newton Raphson methodology swap yield curves.
You can model every instrument of the swap yield curve as a series of fixed cash flows with an NPV of zero. Kondor+ derives some other equations by performing interpolations along the zero coupon or discount factor curves.
Kondor+ then solves the non-linear system of equations using the Newton Raphson process.

Source : Kondor+ 3.0 Curves Guide p.24

Yield Curve Definition – K+ steps needed

- Define appropriate maturity time bands
- Currency Reference index (basket) for Money Market and insert Money Mkt. Floating Rates into this basket.
- Currency Reference index (basket) for Swap (IRS) quotation and insert Swap. Floating Rates into this basket.
- Realtime links of all Floating rates.
- Define the Yield curve

Libor Panel Banks

BBA Panels for LIBOR :

- Australian Dollar (AUD)
- Canadian Dollar (CAD)
- Swiss Franc (CHF)
- Danish Krone (DKK)
- Euro (EUR)
- Sterling (GBP)
- Japanese Yen (JPY)
- New Zealand Dollar (NZD)
- US Dollar (USD)

Source : http://www.bba.org.uk

Libor Panel Banks

STERLING (GBP) - 16 BANKS

Abbey National plc, Bank of America, BNP Paribas, Barclays Bank plc, Citibank NA, Deutsche Bank AG, HBOS, HSBC, JP Morgan Chase, Lloyds TSB Bank Plc, Rabobank, Royal Bank of Canada, The Bank of Tokyo-Mitsubishi Ltd, The Royal Bank of Scotland Group, UBS AG, Westdeutsche Landesbank AG

Composition can change. For details check <0#LIBORRICS>

EURIBOR Fixing Banks

Panel Banks fixing EURIBOR and EONIA :

Rates are set with the help of the ECB (European Central Bank)

47 Banks set the rates
49 are members,
2 banks rotating every 6 months

Composition can change. For details check <0#LIBORRICS>

http://www.euribor.org/html/content/panelbanks.html

…IBORs

And many other … IBORs

- EIBOR (United Arab Emirates)
- HIBOR (Hong Kong)
- JIBOR (Jakarta)
- KIBOR (Kazakhstan)
- LIBOR01 ➔ BBA
- MIBOR (Madrid)
- PIBOR (Paris)
- SIBOR (Singapore)
- TIBOR (Tokyo)
- WIBOR (Warsaw)
- …

Forward Points

- High / Low ➔ subtract
- Low / High ➔ add

- in the US (direct quote):
  - High / Low ➔ Discount for the USD
  - Low / High ➔ Premium for the USD
- in London (indirect quote) :
  - High / Low ➔ Premium for the GBP
  - Low / High ➔ Discount for the GBP

Forward Points – Steps

Example with EURUSD=

Step 1 : $ x interest rate
Step 2 : $ into EURO
Step 3 : Euro x interest rate
Step 4 : Total USD sum (i.e step 1)
---------- = Forward exchange rate
Total Euro Sum (i.e. step 3)

Step 5 : Forward exchange rate – Spot rate = Forward points

Forward Points – Example !!!

Step 1 : $ x interest rate
USD 1000 x 3 M USDD @ 1.09 % = USD 2.75 ➔ 1002.75
Step 2 : $ into EURO
USD 1000 into EURO => EUR= = USD 1000/1.2391 = Euro 807.04
Step 3 : Euro x interest rate
EUR 807.04 x EURD= at 3 M @ 2.09%
807.04 x 2.09 % x 90/360 = Euro 4.22 = Euro 811.26
Step 4 : Total USD sum (i.e step 1)
---------- = Forward exchange rate
Total Euro Sum (i.e. step 3)
EUR of Step 3 at current spot rate i.e. 811.26 x 1.2391 = USD 1005.23
To be compared with USD at step 1..
Step 5 : Forward exchange rate – Spot rate = Forward points
1002.75
= ---------- = 1.2360 ➔ 1.2391 (fx spot) – 1.2360 = 31 bp (QED)
811.26

Cash Assets / Positions vs Swaps

Cash Assets	Swaps
On-Balance sheet	Off-Balance Sheet
Require funding	No funding required
Assets may not be easy to buy (f.ex. S&P 500)	
If bought ➔ credit risk	Cash Flow exchange ➔ no credit risk
Fully taxed (profits / losses /… need to be declared due to on-balance sheet)	Swaps are often more tax friendly

FX Swaps

Simultaneous spot and forward transactions :

Buy / Sell **or** Sell / Buy

A FX swap consists of two legs:

- a spot foreign exchange transaction, and
- a forward foreign exchange transaction

These two legs are executed simultaneously for the same quantity ➔ offset each other

➔ FX swaps can be viewed as FX risk-free collateralised borrowing / lending

It is also common to trade *forward-forward*, where both transactions are for (different) forward dates.

FX Swaps

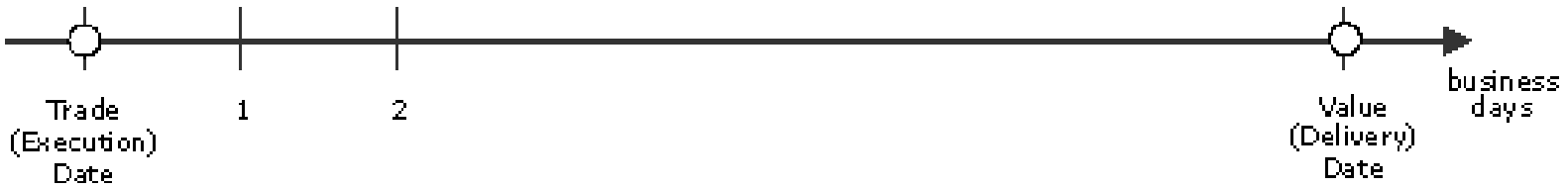
FX swaps have been employed

- to raise foreign currencies, both for financial institutions and their customers, including exporters and importers, as well as institutional investors who wish to hedge their positions.
- to move given currency deals forward or backward in time
- for speculative trading, typically by combining two offsetting positions with different original maturities.

FX swaps are most liquid at terms shorter than one year, but transactions with longer maturities have been increasing in recent years.

Outright Forward

An agreement between a bank and another party to exchange one currency for another at some future date. The rate at which the exchange is to be made, the delivery date, and the amounts involved are fixed at the time of agreement.
=> used to lock in an exchange rate on a specific date.



Outright Forward

≡ single leg FX Swap …..

Outright Forward

Spot

+ interest ccy1

- Interest ccy2

= FWD

To hedge a FWD buying
Eg buy USD vs EUR in 6M
➔
Sell FX Spot USD & buy Euro
Borrow FX - USD
Deposit FX - EUR

NDF Outright Forward

≡ hedging of currencies
- for currencies where government regulations restrict foreign access to the local currency or
- the parties want to compensate for risk without a physical exchange of funds.

Agreed on trade date:

- *principal amount,*
- *forward exchange rate,*
- *fixing date and*
- *forward date*

& basis for the net settlement that is made at maturity in a fully convertible currency.

NDF Outright Forward

At maturity / fixing date, in order to calculate the net settlement, the forward exchange rate agreed at execution is set against the prevailing market 'spot exchange rate' on the fixing date which is two days before the value (delivery) date of the NDF.

NDF Outright Forward - Example

In an NDF, the forward rate used follows the same methodology as the outright forward, but the actual funds exchanged on the value date at maturity will depend on the prevailing spot exchange rate.

If the prevailing spot rate is worse than the forward rate, the NDF is an asset and the holder of the NDF will be receiving funds from the counterparty as settlement. The opposite holds true if the NDF contract is a liability because prevailing spot rates are better that the original forward rate agreed at inception.

NDF Outright Forward

Risk: If the underlying reason for wishing to set the exchange rate for a future delivery date no longer exists, the forward exchange contract may need to be cancelled at prevailing market rates. The unwinding of the position may incur a profit or a loss. (i.e. the 'mark to market' value of the contract).

Forward Contract Pros	Forward Contract Cons
No upfront cost	Counterparty risk i.e. failure to deliver funds at the delivery date
Entering into a forward exchange contract fixes the exchange rate for a future delivery date	Opportunity cost i.e. precludes any future benefit or cost from subsequent exchange rate movements.

NDF – Calculation

1. What is the profit / loss for the following NDF deal:

   COP= (Colombian Peso) trades @ 1960 – 70

   NDF 1 Y 70 – 80

   ➔ Forward rate of 2030 – 2050

a.) You are a corporate client & you need COP in 1Y.

   If you have USD 1000 how many COP= would you get in 1 year with the forward rate?

NDF – Calculation

1 year later…..

COP= has appreciated to 1830 – 1850

What is your profit/loss?

- sum 1 year ago / today's fixing rate
- ➔ 2'050'000/1'850 = 1108.108
- USD1108.108 – USD 1000 = USD 108.108
- ➔ your profit = USD 108.108

NDF – Calculation

1 year later…..

The COP= has depreciated to 2130 – 2150

What is your profit / loss?

- sum 1 year ago / today's fixing rate
- ➔ 2'050'000/2'150 = USD 953.49
- USD 1000 – USD 953.49 = USD 46.51
- ➔ your loss = USD 46.51

NDF – Calculation – Exercise

Argentinian Peso ARS= 3.8550 / 00

NDF 1 Y 0.50 – 0.60

What is the NDF Rate for USD 1’000?

1 year later…..

- The ARS= has depreciated to 4.1000

  What is your profit / loss?

- The ARS= has appreciated to 3.6000

  What is your profit / loss?

NDF – Calculation – Exercise

sum 1 year ago / today's fixing rate

1. ➔ 3.8600 + 0.60 = 3.8660 * 1000 = 3866

   3866/4.1000 = USD 942.93

   USD 1000 – USD 942.93 = USD 57.07

   ➔ your loss = USD 57.07

2. ➔ 3.8600 + 0.60 = 3.8660 * 1000 = 3866

   3866/3.6000 = USD 1'073.89

   USD 1'073.89 – USD 1000 = USD 73.89

   ➔ your profit = USD 73.89

Time Option & Take Up

A take Up is an exercise from a Time Option deal, Time Option Deals are different from normal FX Swap deals in the fact that they integrate the optionality in the contract.

When inserting this kind of deal, in terms of position keeping you have the ability to impact either the Maturity Date or the Option Date (depends on the Admin > Application Config choice:
Time Option Worst Case Scenario.

Roll back – roll over

Rollback and *Rollover* liquidates the full amount or partial amount of FX swap or outright forward deals before (rollback) or after (rollover) their maturity date. This means that you can split the deal into many parts having separate settlement instructions. The separate parts can be pre-delivered or rolled over.

You can perform a roll back if you decide to liquidate, by changing the rate, all or part of an FX swap or outright forward deal that is **not** a time option.

Liquidation vs. Termination

1. Liquidation : stays in books
2. Termination : removed from books

i.e. difference lies in Cash Flows

1. (assignment) : partial termination / liquidation

Loans & Deposits

On-Balance Sheet Items ➔
count for capital requirement measures

Risk is measured by weighting all assets by a given series of coefficients.

Risk – asset ratio is calculated, in accordance to BIS rules

…

Deposits

Conditions :
-Deposit till end of contract
-None of the 2 parties ask for early cancellation
-Interests payable at end
-For longer than 1 year : interests annually & at end

Any deposit which doesn't have a maturity and can be called… Call Account… where the conditions are :
- Related to the call frequency (24 h, 48 h, 7 d, ..)

Deposits

1.) most currencies : 360
UK : 365

2.) real number of days ➔ possibility of 365 / 360

Yield quotes

1.) BEY (US Bond market)

$$B(t,T) = \frac{100}{(1+R^T)^{(\frac{(T-t)}{365}}}$$

2.) MM yield (interbank L&Ds)

$$B(t,T) = \frac{100}{(1-R^T(\frac{(T-1)}{365}))}$$

3.) Discount rates (CPs, T-Bills)

$$B(t,Y) = 100 - R^T(\frac{T-t}{365}) * 100$$

Day Count & Yield/Discount Conventions

		Day Count	Yield
US	Depo/CD	Act/360	Yield
	T-Bill	Act/360	Discount
	Treasuries	Act/act, semi-an.	BEY
Euromarket	Depo	Act//360	Yield
	Eurobonds	30E/360	Yield
UK	Depos/CD/CP	Act/365	Yield
	Gilt	Act/365, semi-an.	BEY

Loans & Deposits

Risk :

Interest rates, i.e. yield curve

➔ Mismatching / gap

Investment Swap = Funding Swap

An Investment Swap is not impacting the Fx Swap positions, but generates

- 1 Spot deal
- 1 synthetic deposit
- 1 synthetic loan

L&D ➔ impacting Balance sheet i.e. on balance sheet item, not off balance sheet as Fx Swaps.

Cash Flow Deals

Cash flow deals are very often used internally for consolidation (calibration) purpose between for example monthly results of an accounting department and the results of trading department.
Adding the extra cash flow you can rebalance the results of both department

Cash Flow Deals

Retail (i.e. small deals) are aggregated and integrated within K+ as CF deals (due to different maturities of the retail deals)

Call Account

A bank account that pays a higher rate of interest than an ordinary account. You have to ask the bank a short time before if you want to take money out.

Particularity of Call Account:

-1 account per client **&** tenor **&** currency

Q : you have 1 client who makes deposits in

- USD, EUR, GBP & CHF
- In all currencies your client does 1W, 1M & 3M deposits.

How many CA do you have to set up for this client?

Forward Rates

Forward interest rates are the rates of interest **implied** by current zero rates for periods of time in the future.

➔If an investor thinks that rates in the future will be different from today's forward rates there are many different trading strategies…

- Forward IAM
- FRAs
- Futures
- IRS
- …

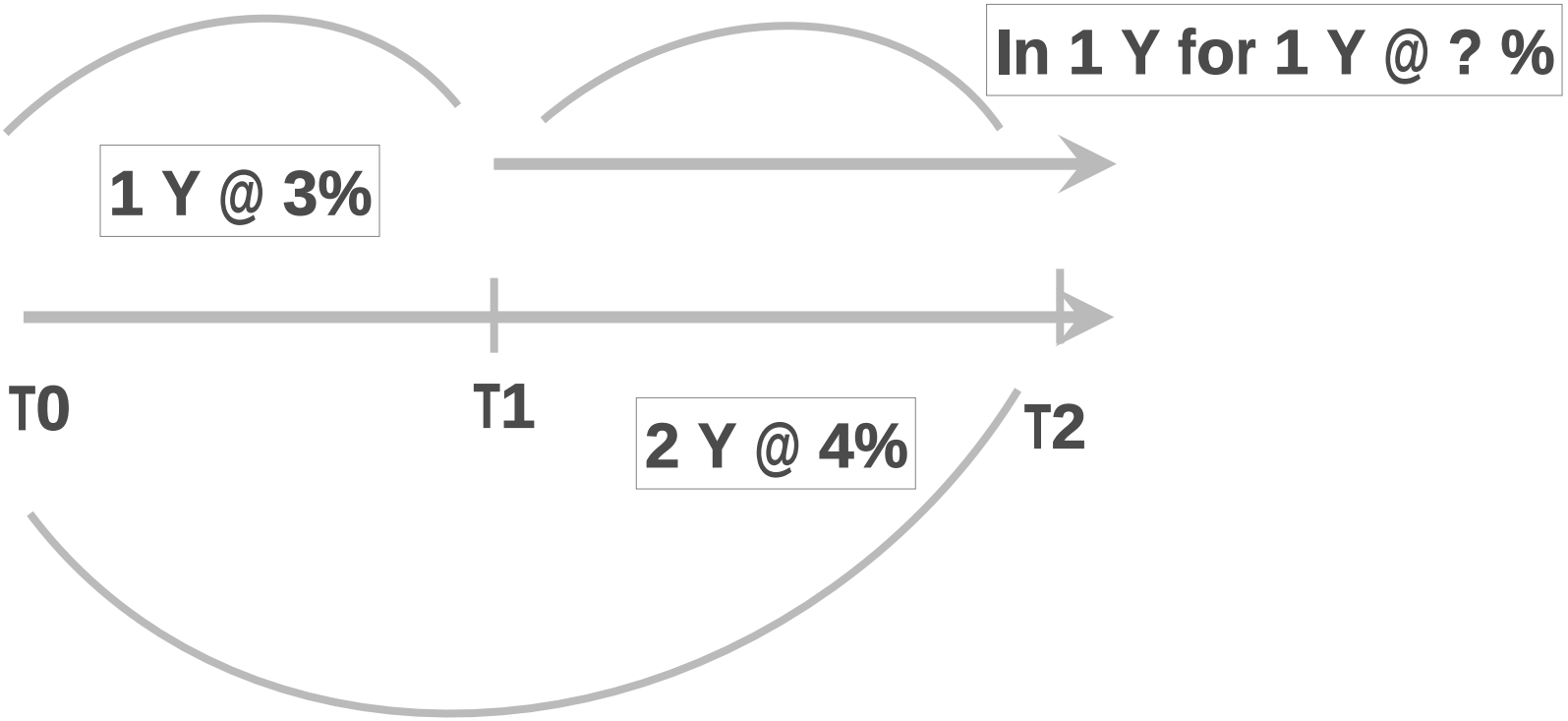
Forward Rates

Forward Rates are the rates of interest implied by current zero rates for periods of time in the future (continuous compounding).

Year n	Zero rate for an n-year investment (% p.a.)	Forward rate for nth year (% p.a.)	return
1	3.0		$100\, e^{0.03 \times 1} = 103.05$
2	4.0	5.0	$100\, e^{0.04 \times 2} = 108.33$
3	4.6	5.8	
4	5.0	6.2	
5	5.3	6.5	

Ex : John Hull, Options, Futures & other derivatives, 6th ed, p.84 ff

Forward Rates - CALCULATE !!!



1*3% + 1*x% = 2*4%
else…
ARBITRAGE…!!!

Forward Rates - CALCULATE !!!

$$R_f = R_2 + (R_2 - R_1)\frac{T_1}{[T_2 - T_1]}$$

Where

R = interest rate of period f, 1, 2, ... i.e. > t_0

T = Time

Year n	Zero rate for an n-year investment (% p.a.)	Forward Rate (calc)	Forward Rate
1	3.0		
2	4.0	= 0.04+(0.04-0.03) * (1/(2-1)	5%
3	5.0	= 0.05+(0.05-0.04) * (2/(3-2)	7 %
4	6.0	= 0.06+(0.06-0.05) * (3/(4-3)	9 %
5	7.0	= 0.07+(0.07-0.06) * (4/(5-4)	11 %

Ex : John Hull, Options, Futures & other derivatives, 6th ed, p.84 ff

Forward Rates - CALCULATE !!!

To calculate the marked-to-market value of a FRA, Kondor+ first calculates the forward rate. Kondor+ calculates estimated (forward) floating rate used for marked-to-market calculations as follows:

$$Forward\ Rate = \left(\frac{Discount\ Factor_{Value\ Date}}{Discount\ Factor_{Maturity\ Date}} - 1\right) \times \frac{Basis \times 100}{No.\ of\ Days_{(Value\ Date,\ Maturity\ Date)}}$$

Loans & Deposits - Forward Loans

Need of forward loans :

- A business would like to lock in the "current" low borrowing rates from money markets
- A bank would like to lock in the "Current" high lending rates
- A business may face a floating-rate liability at time t1. The business may want to hedge this liability by securing a future loan with a known cost

FRAs

Off-Balance Sheet Items ➔
no capital requirement measures

= single period IR swaps

- Notional borrowing or lending
- Exchange of cash equal to the difference between the actual rate on the day and the rate agreed in the FRA
- The buyer of the FRA is the notional borrower, i.e. party seeking protection against a rise in rates
- Seller is the notional lender – the party seeking protection against a fall in rates

FRAs

- CA : contract amount
- CR : contract rate (usually Libor)
  ➔ Ref Data : Libor 3 or 6 M ???
- CP : contract period
- Fixing date : T + 2
- Settlement date
- Settlement sum

- perfect instrument to hedge gaps of loans & deposits
- MM equivalent of forward-FX contracts

FRAs

Buy a FRA = Fixed rate loan, running from t1 to t2 with rate fixed @ t0 + Floating rate deposit, running from t1 to t2 with rate fixed at t1

FRAs are contracted @t0 and settled @t1

Futures

- A contract that conveys the obligation to buy or sell a particular item at a certain price for a limited time.

- Both the buyer and the seller of the contract are obligated to perform

Specifications of Futures contracts

- Underlying asset
- Contract Size / Unit of trading
- Price quotes : easy to understand ➔ priced and quoted similar to the underlying
- Minimum Price move : consistent with the way the underlying is traded
- Last trading day and time (for settlement price)
- Delivery Arrangements (in case of physical delivery possibility)
- Delivery Months : specified by the Exchanges
- Delivery Day
- Trading hours
- .... ???? Anything else ???? ➔ BACKGROUND

Specifications of CME® Eurodollars 0#ED:

A leader looks the part. And nothing comes close :

- open interest ~ 6.7 mio contracts
- = ~ 6 bn in volume
- Daily volume of ~ 2.8 million for CME Eurodollar futures and options on futures.
- ~ With 95% of CME Eurodollar futures trading electronically on the CME Globex® platform.
- EDs are USDs on deposit in commercial banks located outside of the US. ED deposits play a major role in the international capital market, and they have long served as a benchmark interest rate for corporate funding.
- CME® Eurodollar futures contracts reflect the BBA 3-month ED Interbank Time Deposits

Specifications of ED:

- **Trade Unit** Eurodollar Time Deposit having a principal value of $1,000,000 with a three-month maturity.
- **Point Descriptions** 1 point = .01 = $25.00 (i.e. from 94.63 to 94.64)
- **Contract Listing** Mar, Jun, Sep, Dec, Forty months in the March quarterly cycle, and the four nearest serial contract months.
- **Strike Price Interval** N/A
- **Product Code** Clearing & Ticker =ED GLOBEX=GE
- **Contract description** CME/ED

Details on ED:

Buy ED: Future = promise to “deposit” USD 100 – (1 x ft0 exp yf) @ t1 and receive 100 in 3 M

Then implied annual interest rate on this loan =

Ft0 = (100 – Qt0) / 100

Eg. Future price of 99.60 = implied FWD rate of 0.04%

Other STIR contracts

<FUT/IR1>

Eurex 3 M Euribor Future	<0#FEU3:>
LIFFE Euribor	<0#FEI:>
LIFFE Short Sterling	<0#FSS:>

<FUTURES>

<LIF/FUTEX3>

<LIF/FSS>	<LIF/FEI>

FRAs vs Short term Interest Rate Future

FRAs	**STIR Future**
Flexible	Standard
Confidentiality	Terms known
No margin requirement	Margin requirement Mark to market
@ settlement (t1) change hands of different interest rate quotes	CFs Daily on price quote
Sell FRA	Sell Future (but buy STIR)
Non netting of contracts	Fungible ➔ netting of contracts
Convexity	Linear price

Bonds

on balance sheet assets / liabilities

Become off balance sheet by
- Securitization
- IRS
- Asset Swaps
- …

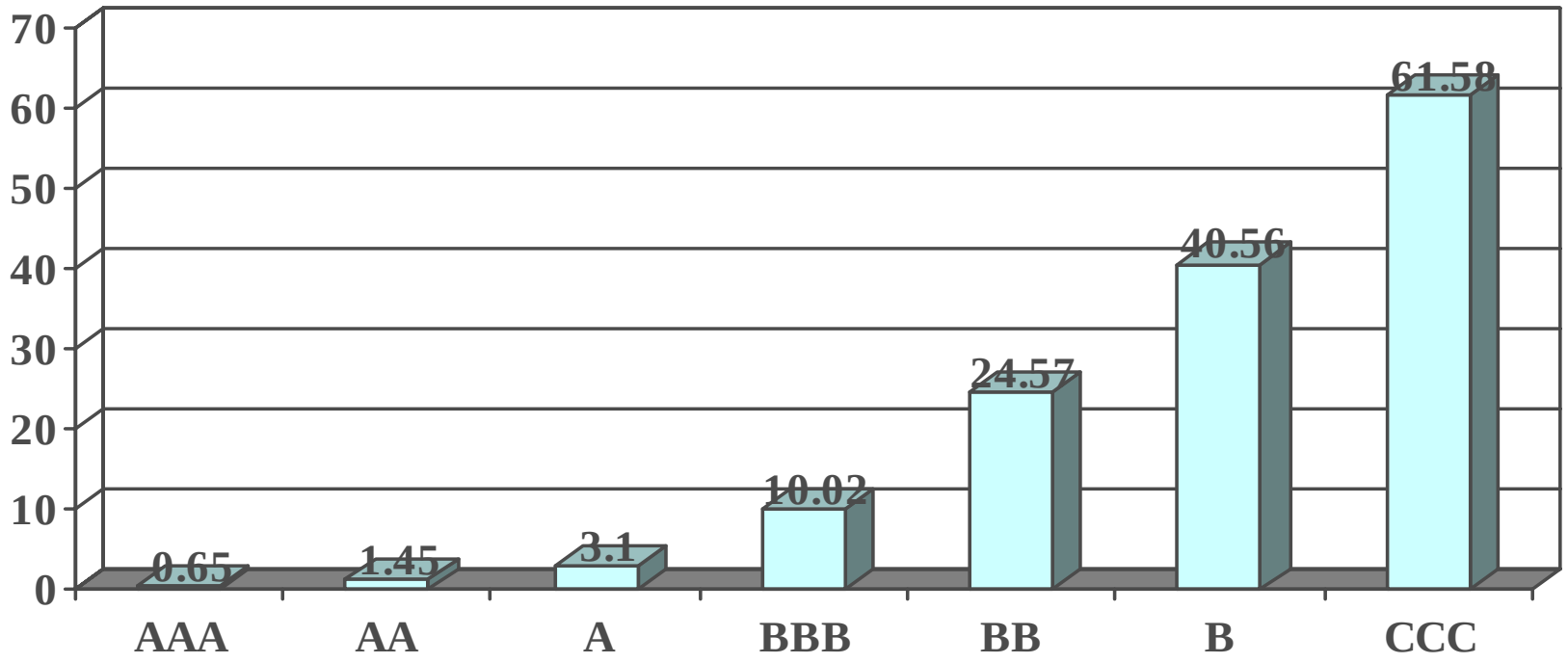
Ranking :
- Senior (guaranteed or not guaranteed),
- Subordinate (guaranteed or not guaranteed),
- Junior,
- Mezzanine…

Debt Recovery Rate

Senior Secured Bank Loans	70.26 %
Senior Secured bonds	55.15 %
Senior unsecured bonds	51.31 %
Senior subordinated bonds	39.05 %
Subordinated bonds	32.74 %
Junior subordinated bonds	20.39 %

Bond Ratings : Probability of default

Probability of default in % based on long term debt analysis by S&P



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THOMSON REUTERS

Source: S&P and F&W

Hedging

➔'60s hedge only (i.e. reduce risk)
'60s ➔ hedge (i.e. reduce risk) & expected return

➔ Minimize the price risk & maximize the expected P&L over the hedging period

Hedging risk :

- Maturity mismatch
- Proxy hedging

Batch Process

- **Not on a regular basis (once…) :** just after installation or end of year when closing out positions / archiving deals
- **Regularly** : f.ex. Varifying that KplusBatch ran correctly (nightly K+ batch process) or Performing revaluations
- **Periodically** : after installation and setting up of the database, f.ex. Veryfiying the integrity of the K+ database

Only ONE User ➔ SUPERUSER, part of Admin Group

Admin Guide p. 64 ff

Batch Process

- **Run at 1am** (if change of time ➔ *Admin Guide)*
- Sequential or distributed
- Batch run : real-time servers stop and are reinitialized once batch job finished
- If batch job failed ➔ run manually

Batch Process

To check the batch job:

- Audit trail
- Log files
- Batch Monitor (Admin > System > …)

Which batch jobs are run ????

Admin Guide p. 72 ff.

Verify Positions

Position Checker :

- allows to verify positions and cash flows for coherency with the deals that generated them.

You must verify positions and cash flows:

- when a K+ warning message indicates that there is a problem related to a position or cash flow table
- whenever you are unsure of the accuracy of a position or cash flow, for example, if a crash occurs and data in position tables is lost
- when upgrading K+

  Positions & Cash Flows Checker also allows to update positions and cash flow records to restore coherency with the deals that generated them.

Schedule Checker

- recalculates rates and cashflows
- verifies fixing and forward dates
- verifies all dates

Schedules can be selected by

- types of instrument,
- hierarchy,
- floating rates, or
- Cities

Admin Guide p. 127 ff.

Revaluations

- You run revaluations to determine your breakeven price for tomorrow. Revaluation results and reports display profit or loss in the local currency that results from the insertion of deals since the previous revaluation.
- As all revaluation rates are against the local currency, Kondor+ calculates and applies the revaluation rates between two foreign currencies where all pairs have a direct quotation mode as follows:

$$Revaluation\ Rate = \frac{Revaluation\ Rate_{Ccy1/LocCcy} \times Quotation\ Unit_{Ccy2/LocCcy}}{Revaluation\ Rate_{Ccy2/LocCcy} \times Quotation\ Unit_{Ccy1/LocCcy}} \times Quotation\ Unit$$

Reval

Admin Guide

p. 142 ff.

Results displays the P/L from start, daily, monthly, and yearly for each currency pair. Kondor+ displays the total P/L in red at the end of each column.

FOR:	*RESULTS* DISPLAYS:
Spot, according to the level of hierarchy	▪ P/L for each currency pair in spot positions ▪ total local P/L for each group of currency pairs in red ▪ overall local P/L in the last columns of the table
Securities, futures, options, papers, warrants, and OTC options, according to the level of hierarchy	▪ *P/L from Start* ▪ *Daily P/L* ▪ *Monthly P/L* (P/L for the **current** month) ▪ *Yearly P/L* (P/L for the **current** year
Money market, according to the level of hierarchy, calculation method, and deals (periodic-collateralized loans & deposits, IAM-discounted loans & deposits, repos, and paper & CDs)	▪ *Mat. Start P/L* ▪ *P/L from Start* ▪ *Total Start P/L* ▪ *Daily P/L* ▪ *Monthly P/L* (P/L for the **current** month) ▪ *Yearly P/L* (P/L for the **current** year)
Call accounts, according to the level of hierarchy	▪ *Mat. P/L from Start* ▪ *P/L from Start* ▪ *Total Start P/L* ▪ *Daily P/L* ▪ *Monthly P/L* (P/L for the **current** month) ▪ *Yearly P/L* (P/L for the **current** year)
FX swap	Different views, according to the *Calculation Method*: ▪ *Daily Fwd Cost to Close* ▪ *Daily Fwd Swap Diff* ▪ *Daily Fwd Linear* ▪ *Daily Fwd Summary* ▪ *Global Summary* ▪ *Carry Summary* If you enter a *Report Currency* or *Basket Currency*, Kondor+ displays the P/L for each currency pair in it, in addition to the other results (see FX Swap Revaluation Methodology).

Reval

- **seven** most recent revaluation reports on bonds, equities, futures, options, warrants
- **five** most recent revaluation reports on L & Ds (periodic & IAM), repos, paper & CDs, call accounts

Admin Guide p. 142 ff.