

Master of Science

Pricing of Structured Products

Laboratory Session

Pricing and hedging a portfolio of corporate bonds

Gianluca Fusai

Dipartimento SEMEQ
Università del Piemonte Orientale
gianluca.fusai@eco.unipmn.it

Università Luigi Bocconi - Academic Year 2010-11

Outline

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

- 1 Introduction
- 2 The Portfolio
- 3 Tools
- 4 Nelson Siegel
- 5 Market Information
- 6 Corporate Bonds
- 7 Sensitivity Analysis and Hedging
- 8 New Bloomberg functionalities

The problem

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

- We have built the term structure of spot rates
- We would like to price different types of corporate bonds
- Using a swap, we would like to hedge the portfolio exposure to parallel shift in the term structure
- Home Project: Repeat with a different portfolio and hedge also against changes in the slope of the term structure.
- We take market information from the cap volatility curve and from the term structure of credit spreads.

The Portfolio Composition

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

- Fixed Coupon Bond (ISIN IT0001301776).
- Floating Rate Note (ISIN XS0115565821).
- Bonds containing Digitals (ISIN IT0001385050).
- Bonds containing Digitals (ISIN IT0001207064).
- The hedging instrument is a swap

Tools from Excel: calendar functions

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functionalities

YearFrac(start_date; end_date; basis)

Returns the year fraction representing the number of whole days between start_date and end_date

		d_e d_t	25/10/1996 31/12/1996	27/01/1998 01/02/1999	
Day Count	Basis				
30/360	0		0.1833333333	1.0111111111	=Yearfrac(\$E\$4,\$E\$5,C7)
ACT/ACT	1		0.183060109	1.013698630	=Yearfrac(\$E\$4,\$E\$5,C8)
ACT/360	2		0.1861111111	1.0277777778	=Yearfrac(\$E\$4,\$E\$5,C9)
ACT/365	3		0.183561644	1.013698630	=Yearfrac(\$E\$4,\$E\$5,C10)
30/360	4		0.1805555556	1.0111111111	=Yearfrac(\$E\$4,\$E\$5,C11)

Couppcd(Settlement,Maturity,Frequency,Basis) Coupncd(Settlement,Maturity,Frequency,Basis) Coupdays(Settlement,Maturity,Frequency,Basis) Coupdays(Settlement,Maturity,Frequency,Basis)

Return the:

1. the coupon date before the settlement date
2. the coupon date successive to the settlement date
3. the number of days from the beginning of the coupon period to the settlement date
4. the number of days in the coupon period containing the settlement date

Maturity	01/02/2006	
Trade Date	28/10/2003	
Value Date	31/10/2003	
Frequency	2	number of coupons in the year
Basis	1	day count convention
Payment Date of last coupon	01/08/2003	=Couppcd(E27,E25,E28,E29)
Payment Date of next coupon	01/02/2004	=Coupncd(E27,E25,E28,E29)
Annual coupon	2.75	
Days since last coupon	91	=Coupdays(E27,E25,E28,E29)
Days in the coupon period	184	=Coupdays(E27,E25,E28,E29)
Accrued Interest	0.68003	=(E32/2)*E33/(E34)

Coupnum(Settlement,Maturity,Frequency,Basis)

Returns the number of coupons between the settlement date and the maturity

Value Date	31/10/2003	
Maturity	01/02/2006	
Frequency	2	number of coupons in the year
Basis	1	day count convention
Number of coupons	5	number of coupons up to maturity

Tools from VBA: pricing functions

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

Nelson Siegel VBA functions

Function **NelsonSiegelFwd(beta0 As Double, beta1 As Double, beta2 As Double, kappa As Double, tau As Double) As Double**
compute the instantaneous forward rate in NS

Function **NelsonSiegelSpot(beta0 As Double, beta1 As Double, beta2 As Double, kappa As Double, tau As Double) As Double**
compute the instantaneous spot rate in NS

Function **NelsonSiegelPrice(beta0 As Double, beta1 As Double, beta2 As Double, kappa As Double, tau As Double) As Double**
computes the discount factor in NS

Function **NelsonSiegelSimpleSpot(beta0 As Double, beta1 As Double, beta2 As Double, kappa As Double, tau As Double, tenor As Double) As Double**
computes the simple spot rate in NS

Function **NelsonSiegelSimpleFwd(beta0 As Double, beta1 As Double, beta2 As Double, kappa As Double, tau As Double, tenor As Double) As Double**
computes the simple forward rate in NS

Black VBA functions

Function **UndiscountedBlackDigitalAN(phi As Integer, dFwdrate As Double, dCaprate As Double, dVolat As Double, dOptionMaturity As Double) As Double**
computes the price of Asset-or-Nothing option (phi=1: call, phi=-1: put)

Function **UndiscountedBlackDigitalCN(phi As Integer, dFwdrate As Double, dCaprate As Double, dVolat As Double, dOptionMaturity As Double) As Double**
computes the price of Asset-or-Nothing option (phi=1: call, phi=-1: put)

Function **UndiscountedBlackCaplet(phi As Integer, dFwdrate As Double, dCaprate As Double, dVolat As Double, dOptionMaturity As Double, dtenor) As Double**
computes the price of a caplet/floorlet (phi=1: caplet, phi=-1: floorlet)

The Nelson Siegel Curve

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

The Nelson-Siegel Discount function

- The spot rate is obtained by integrating the eq. above over the time to maturity τ :

$$R(t, t+\tau) = \frac{\int_0^\tau f(t, u) du}{\tau} = \beta_0 + \left(\beta_1 + \frac{\beta_2}{k} \right) \frac{1 - \exp(-\tau k)}{\tau k} - \frac{\beta_2}{k} \exp(-\tau k).$$

β_0	4.70%	◀	▶
β_1	3.10%	◀	▶
β_2	7.34%	◀	▶
k	0.07	◀	▶

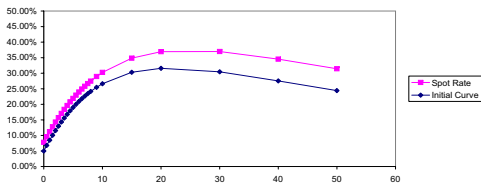
- β_0 specifies the long rate to which the fwd rate horizontally asymptotically,
- β_1 is the weight attached to the short term component (spread short/long-term),
- β_2 is the weight attached to the medium term component,
- k measures the point of the beginning of decay:

$$R(t, t+s) = \beta_0 + \beta_1 s \text{ as } s \rightarrow 0$$

$$R(t, t+s) = \beta_0 \text{ as } s \rightarrow +\infty$$

$b_0=2.5\%$, $b_1=2.5\%$,
 $b_2=7.5\%$, $k=0.08$

maturity	Initial Curve	Spot Rate
0	5.00%	7.80%
0.5	6.78%	9.54%
1	8.46%	11.20%
1.5	10.05%	12.78%
2	11.56%	14.28%
2.5	12.98%	15.72%
3	14.32%	17.08%
3.5	15.59%	18.38%
4	16.79%	19.61%
4.5	17.92%	20.78%
5	18.99%	21.90%
5.5	19.99%	22.95%
6	20.93%	23.96%
6.5	21.82%	24.91%
7	22.65%	25.81%
7.5	23.43%	26.66%
8	24.16%	27.47%
9	25.48%	28.95%
10	26.63%	30.27%
15	30.31%	34.84%
20	31.58%	36.94%
30	30.46%	36.97%
40	27.53%	34.54%
50	24.40%	31.45%



The Term Structure of Volatilities

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functional-
ities

<HELP> for explanation.

Enter 1 <Go> to save setting

DL18 Equity **SWYV**

Euro Volatility Cap/Floor

M (B-Bid /A-Ask /M-Mid)

Page 1/3

	1 wk	1 mo	2 mo	3 mo	4 Mo	5 mo	6 mo	9 mo	1 yr
Cap :									27.640
Flr :									29.700
Time:									2/27
Src :									CMPN
	18 mo	2 yr	30 mo	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr
Cap :		29.820		28.470	26.300	24.310		21.120	
Flr :		28.500		26.000	23.900	22.200		19.800	
Time:		2/27		2/27	2/27	2/27		2/27	
Src :		CMPN		CMPN	CMPN	CMPN		CMPN	
	9 yr	10 yr	11 yr	12 yr	15 yr	20 yr	25 yr	30 yr	
Cap :		18.100							
Flr :		17.000							
Time:		2/27							
Src :		CMPN							

Source: **CMPN 2/27**

<Menu> to select another ccy

1 <Go> to save Bid/Ask/Mid

2 <Go> to modify sources

Australia 61 2 9777 8600

Brazil 5511 3048 4500

Europe 44 20 7330 7500

Germany 49 69 920410

Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000

U.S. 1 212 318 2000

Copyright 2003 Bloomberg L.P.

6374-742-0 28-Feb-03 8:57:58

Credit Spreads

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functional-
ities

Backpage
<PAGE> per più info o <MENU> per lista di curve.

DL18 Corp

FMC

Curve settore Fair Market

Pag 1 / 2

INTERVALLO SCAD 3MO - 30Y

Valuta



Credit Spreads

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functionalities

Page
<PAGE> per più info o <MENU> per lista di curve.

DL18 Corp

FMC

Curve settore Fair Market

Pag 2/ 2

Curva	889 +	890 +	891 +	892 +	893 +	894 +
Nome	€ Bank AA1	€ Bank AA2	€ Bank AA3	€ Bank A1	€ Bank A2	€ Bank A3
3ms	3.64	3.70	3.71	3.72	3.94	4.20
6ms	3.67	3.74	3.74	3.78	3.99	4.18
1an	4.08	4.14	4.15	4.20	4.33	4.35
2an	4.49	4.52	4.53	4.61	4.71	4.77
3an	4.79	4.80	4.84	4.92	5.01	5.05
4an	4.91	4.94	5.05	5.08	5.22	5.42
5an	5.06	5.13	5.22	5.25	5.41	5.54
7an	5.27	5.31	5.42	5.47	5.61	5.84
8an	5.33	5.39	5.46	5.52	5.70	5.97
9an	5.42	5.48	5.49	5.61	5.76	6.03
10an	5.47	5.66	5.69	5.75	5.88	6.12
15an	5.69	5.87	5.90	6.06	6.23	6.39
20an						
25an						
30an						

Freq: 2

+ = curva varia in giornata con la curva benchmark

Australia 61 2 9777 8600

Brazil 5511 3048 4500

Europe 44 20 7330 7500

Germany 49 69 920410

Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 212 1000 U.S. 1 212 318 2000

Copyright 2002 Bloomberg L.P.
6373-428-0 05-Apr-02 17:51:42

Banca Mediocredito SPA (ISIN IT0001301776)

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

	A	B	C	D	E	F	G	H	I	J
1	Banca Mediocredito SPA	Caution: do not move Nominal from cell B5 and Clean Price from cell B19								
2	ISIN IT0001301776	FIXED RATE BOND								
3		INPUT								
4	Features:	Parameters:								
5	Nominal	100								
6	Maturity	29-gen-09								
7	Trade date	28-feb-03	6	Rating	Bank Aaa3					
8	Settlement date (2 days later)	04-mar-03		Credit Spread	0.90%	< flat				
9	Time to maturity	5.908								
10	# payments per year	1								
11	Day-count convention	1	act/act							
12	Last coupon date	29-gen-03								
13	Time from last coupon payment	0.093								
14	Fixed rate Coupon	4.25%								
15										
16										
17	Gross Price	98.0294								
18	Accrued Interest	0.3959								
19	Clean Price	97.6335								
20										
21	Coupon Dates	day of the week (Sat = 7, Sun = 1)	Adjusted Coupon Dates	Tenor $\alpha(T(i-1), T(i))$	Time	Risky Discount Factor	Simple Forward Rate	Fwd Fwd Vol $\sigma(F(t, T(i-1), T(i)))$	Expected Coupon	Discount Factor x Expected Coupon
22	29-gen-03	4	29-gen-03							
23	29-gen-04	5	29-gen-04	1.00000000	0.906849	0.963251	not relevant	not relevant	0.04250000	0.0409382
24	29-gen-05	7	31-gen-05	1.006839945	1.913321	0.920928	not relevant	not relevant	0.04279070	0.0394071
25	29-gen-06	1	30-gen-06	0.997260274	2.910335	0.879108	not relevant	not relevant	0.04238356	0.0372597
26	29-gen-07	2	29-gen-07	0.997260274	3.907448	0.838285	not relevant	not relevant	0.04238356	0.0355295
27	29-gen-08	3	29-gen-08	1	4.905109	0.798866	not relevant	not relevant	0.04250000	0.0339518
28	29-gen-09	5	29-gen-09	1	5.907704	0.760870		not relevant	1.04250000	0.7932074

Pricing Banca Mediocredito SPA (ISIN IT0001301776)

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

	A	B	C	D	E	F	G	H	I	J
1	Banca Mediocredito SPA									
2	Caution: do not move Manual Bond of BS and Clean Price from cell B9									
3	FIXED RATE BOND									
4	BOND									
5	Features	Parameters								
6	Maturity	100								
7	Trade date	29-gen-03								
8	Settlement date (2 days later)	29-Feb-03								
9	Time to maturity	5.008								
10	# payments per year	1								
11	Day-count convention	1								
12	1st coupon date	29-gen-03								
13	Time from last coupon payment	0.095								
14	FixedRate Coupon	4.25%								
15										
16										
17	Flow Price	94.094								
18	Accrued Interest	0.999								
19	Clean Price	95.093								
20										
Coupon Dates										
21	29-gen-03	4	29-gen-03							
22	29-gen-04	5	29-gen-04							
23	29-gen-05	7	31-gen-05							
24	29-gen-06	1	30-gen-06							
25	29-gen-07	2	29-gen-07							
26	29-gen-08	3	29-gen-08							
27	29-gen-09	5	29-gen-09							
28										
Tenor of (1)+(4)+(11)				Time	Risk/Discount Factor	Simple Forward Rate	Forward Volatility (1E-11/100)	Expected Coupon	Discount Factor x Expected Coupon	
29				0.00849	0.03251	not relevant	not relevant	0.052000	0.049782	
30				1.9321	0.02928	not relevant	not relevant	0.042700	0.034071	
31				2.91835	0.02708	not relevant	not relevant	0.0428356	0.027297	
32				3.97448	0.03265	not relevant	not relevant	0.0428356	0.035595	
33				4.98109	0.03866	not relevant	not relevant	0.0428356	0.033918	
34				5.97704	0.04670	not relevant	not relevant	0.0428356	0.032074	

Banca popolare di Lodi (ISIN XS0115565821)

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functionalities

DES

DL18 Corp DES

DESCRIZIONE TITOLO

Page 1/ 3

BANCA POP LODI BPLO Float 08/05 99.8574/100.0382

BGN @ 4/04

INFO EMITTENTE		IDENTIFICATORI		1) Info ulteriori 2) Tassi var. 3) Identif. 4) Rating 5) Comm/Restrizioni 6) Notizie titolo 7) Parti interessate 8) Note personalizzate 9) Info emittente 10) ALLQ 11) Fonte prezzi 12) Titoli associati 13) Sito web emittente
Nome BANCA POPOLARE DI LODI		Common	011556582	
Tipo Cooperative Banks		ISIN	XS0115565821	
Mercato emissionEURO MTN		Wertpap.	509252	
INFORMAZIONI TITOLO		RATING		65) DES prec 66) Invio allegato
Paese IT	Valuta EUR	Moody's	A3	
Collaterale	SENIOR NOTES	Fitch	A-	
Calcolo (21)FLOAT RATE NOTE		Composite	A3	
Scadenza 8/ 4/2005 Serie EMTN		AMM EMMIS		65) DES prec 66) Invio allegato
NORMAL		Amm emesso		
Cedola3.651	FLOATING QUARTLY	EUR 600,000.00	(M)	
QUARTL EURIBO+28	ACT/360	Qtà circolante		
Data annuncio	7/26/00	EUR 600,000.00	(M)	
Dt godimento	8/ 4/00	Minimi/Incrementi		
Imo regolamento	8/ 4/00	1,000.00/ 1,000.00		
Dt prima cedola	11/ 6/00	Val nomin. 1,000.00		
PzEmiss 99.8220	Reoffer 99.822	BOOK RUNNER/BORSA		65) DES prec 66) Invio allegato
SENZA PROSPETTO		MSDW		
		LUXEMBOURG		

CPN RATE=3MD EURIBOR +28BP. ORIGINAL ISS AMT: €500MM. ADDL €100MM ISS'D 9/00 @ 99.817%.

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 212 1000 U.S. 1 212 318 2000 Copyright 2002 Bloomberg L.P.
6373-428-0 05-Apr-02 18:31:15

Pricing Banca popolare di Lodi (ISIN XS0115565821)

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functionalities

	A	B	C	D	E	F	G	H	I	J
1	Banca popolare di Lodi									
2	Caution: do not move Nominal from cell B5 and Clean Price from cell B10									
3	ISIN: XS0115565821									
4	Name: Banca popolare di Lodi									
5	Issuer	100		Parameters:				Basis: As Double, -		
6	Maturity	04-ago-05		Rating		bank A3		basis: As Double, -		
7	Trade date	28-ago-03	6	Credit Spread	0.25%	-	Est	basis: As Double, -		
8	Settlement date (2 days later)	04-set-03		Spread				basis: As Double, -		
9	Time to maturity	2.420						basis: As Double, -		
10	Y payment per year	4						basis: As Double, -		
11	Day count convention	2	act/360					basis: As Double, -		
12	First coupon date	04-ago-03						basis: As Double, -		
13	Time from last coupon payment	0.077	0.28596667					basis: As Double, -		
14	First coupon	3.651%						basis: As Double, -		
15	Yield	3.651%						basis: As Double, -		
16								basis: As Double, -		
17	Clean Price	99.8410						basis: As Double, -		
18	Dirty Price	99.8410						basis: As Double, -		
19	Accrued Interest	0.0000						basis: As Double, -		
20	Yield to Maturity	3.651%						basis: As Double, -		
21								basis: As Double, -		
22								basis: As Double, -		
23								basis: As Double, -		
24								basis: As Double, -		
25								basis: As Double, -		
26								basis: As Double, -		
27								basis: As Double, -		
28								basis: As Double, -		
29								basis: As Double, -		
30								basis: As Double, -		
31								basis: As Double, -		
32								basis: As Double, -		
33								basis: As Double, -		
34								basis: As Double, -		
35								basis: As Double, -		
36								basis: As Double, -		
37								basis: As Double, -		
38								basis: As Double, -		
39								basis: As Double, -		
40								basis: As Double, -		
41								basis: As Double, -		
42								basis: As Double, -		
43								basis: As Double, -		
44								basis: As Double, -		
45								basis: As Double, -		
46								basis: As Double, -		
47								basis: As Double, -		
48								basis: As Double, -		
49								basis: As Double, -		
50								basis: As Double, -		
51								basis: As Double, -		
52								basis: As Double, -		
53								basis: As Double, -		
54								basis: As Double, -		
55								basis: As Double, -		
56								basis: As Double, -		
57								basis: As Double, -		
58								basis: As Double, -		
59								basis: As Double, -		
60								basis: As Double, -		
61								basis: As Double, -		
62								basis: As Double, -		
63								basis: As Double, -		
64								basis: As Double, -		
65								basis: As Double, -		
66								basis: As Double, -		
67								basis: As Double, -		
68								basis: As Double, -		
69								basis: As Double, -		
70								basis: As Double, -		
71								basis: As Double, -		
72								basis: As Double, -		
73								basis: As Double, -		
74								basis: As Double, -		
75								basis: As Double, -		
76								basis: As Double, -		
77								basis: As Double, -		
78								basis: As Double, -		
79								basis: As Double, -		
80								basis: As Double, -		
81								basis: As Double, -		
82								basis: As Double, -		
83								basis: As Double, -		
84								basis: As Double, -		
85								basis: As Double, -		
86								basis: As Double, -		
87								basis: As Double, -		
88								basis: As Double, -		
89								basis: As Double, -		
90								basis: As Double, -		
91								basis: As Double, -		
92								basis: As Double, -		
93								basis: As Double, -		
94								basis: As Double, -		
95								basis: As Double, -		
96								basis: As Double, -		
97								basis: As Double, -		
98								basis: As Double, -		
99								basis: As Double, -		
100								basis: As Double, -		
101								basis: As Double, -		
102								basis: As Double, -		
103								basis: As Double, -		
104								basis: As Double, -		
105								basis: As Double, -		
106								basis: As Double, -		
107								basis: As Double, -		
108								basis: As Double, -		
109								basis: As Double, -		
110								basis: As Double, -		
111								basis: As Double, -		
112								basis: As Double, -		
113								basis: As Double, -		
114								basis: As Double, -		
115								basis: As Double, -		
116								basis: As Double, -		
117								basis: As Double, -		
118								basis: As Double, -		
119								basis: As Double, -		
120								basis: As Double, -		
121								basis: As Double, -		
122								basis: As Double, -		
123								basis: As Double, -		
124								basis: As Double, -		
125								basis: As Double, -		
126								basis: As Double, -		
127								basis: As Double, -		
128								basis: As Double, -		
129								basis: As Double, -		
130								basis: As Double, -		
131								basis: As Double, -		
132								basis: As Double, -		
133								basis: As Double, -		
134								basis: As Double, -		
135								basis: As Double, -		
136								basis: As Double, -		
137								basis: As Double, -		
138								basis: As Double, -		
139								basis: As Double, -		
140								basis: As Double, -		
141								basis: As Double, -		
142								basis: As Double, -		
143								basis: As Double, -		
144								basis: As Double, -		
145								basis: As Double, -		
146								basis: As Double, -		
147								basis: As Double, -		
148								basis: As Double, -		
149								basis: As Double, -		
150								basis: As Double, -		
151								basis: As Double, -		
152								basis: As Double, -		
153								basis: As Double, -		
154								basis: As Double, -		
155								basis: As Double, -		
156								basis: As Double, -		
157								basis: As Double, -		
158								basis: As Double, -		
159								basis: As Double, -		
160								basis: As Double, -		
161								basis: As Double, -		
162								basis: As Double, -		
163								basis: As Double, -		
164								basis: As Double, -		
165								basis: As Double, -		
166								basis: As Double, -		
167								basis: As Double, -		
168								basis: As Double, -		
169								basis: As Double, -		
170								basis: As Double, -		
171								basis: As Double, -		
172								basis: As Double, -		
173								basis: As Double, -		
174								basis: As Double, -		
175								basis: As Double, -		
176								basis: As Double, -		
177								basis: As Double, -		
178								basis: As Double, -		
179								basis: As Double, -		
180								basis: As Double, -		
181								basis: As Double, -		
182								basis: As Double, -		
183								basis: As Double, -		
184								basis: As Double, -		
185								basis: As Double, -		
186								basis: As Double, -		
187								basis: As Double, -		
188								basis: As Double, -		
189								basis: As Double, -		
190								basis: As Double, -		
191								basis: As Double, -		
192								basis: As Double, -		
193								basis: As Double, -		
194								basis: As Double, -		
195								basis: As Double, -		
196								basis: As Double, -		
197								basis: As Double, -		
198								basis: As Double, -		
199								basis: As Double, -		
200								basis: As Double, -		
201								basis: As Double, -		
202								basis: As Double, -		
203								basis: As Double, -		
204								basis: As Double, -		
205								basis: As Double, -		
206								basis: As Double, -		
207								basis: As Double, -		
208								basis: As Double, -		
209								basis: As Double, -		
210								basis: As Double, -		
211								basis: As Double, -		
212								basis: As Double, -		
213								basis: As Double, -		
214								basis: As Double, -		
215								basis: As Double, -		
216								basis: As Double, -		
217								basis: As Double, -		
218								basis: As Double, -		
219								basis: As Double, -		
220								basis: As Double, -		
221								basis: As Double, -		
222								basis: As Double, -		
223								basis: As Double, -		
224								basis: As Double, -		
225								basis: As Double, -		
226								basis: As Double, -		
227								basis: As Double, -		
228								basis: As Double, -		
229										

Interbanca (ISIN IT0001385050)

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functionalities

DES

DL18 Corp DES

Cancel: Screen not saved

DESCRIZNE OBLG INDICIZZATE Page 1/ 3

INTERBANCA INTBA 0 10/20/04 NOT PRICED

INFO EMITTENTE		IDENTIFICATORI		1) Info ulteriori 2) Tassi var. 3) Identif. 4) Rating 5) Comm/Restrizioni 6) Note personalizzate 7) Info emittente 8) ALLQ 9) Fonte prezzi 10) Titoli associati 11) Sito web emittente
Nome INTERBANCA		ISIN	IT0001385050	
Tipo Finance-Invest Bnkr/Brkr		Italy	138505	
Mercato emissionEURO-ZONE		BB number	EC1892032	
INFORMAZIONI TITOLO		RATING		
Paese IT	Valuta EUR	Moody's	NA	
Collaterale	BONDS	S&P	NA	
Calcolo (233)CCT FLOATERS		Fitch	NA	
Scadenza 10/20/2004 Serie 380		AMM EMMIS		
NORMAL		Amm emesso		
Cedola3.91	VARIABLE ANNUAL	EUR	2,500.00 (M)	
ANNUAL EURIBO+50	ACT/ACT	Qtà circolante		
Data annuncio	10/12/99	EUR	2,500.00 (M)	
Dt godimento	10/20/99	Minimi/Incrementi		
1mo regolamento	10/20/99	1,000.00/ 1,000.00		
Dt prima cedola	10/20/00	Val nomin. 1,000.00		
PzEmiss	100.0000	BOOK RUNNER/BORSA		
SENZA PROSPETTO				65) DES prec 66) Invio allegato

CPN RATE=4 $\frac{1}{2}$ % TO 10/00; THEREAFTER 12MO EURIBOR +50BP, IF 12MO EURIBOR <= 5% ON EACH RESET DATE; OTHERWISE 3 $\frac{1}{2}$ %.

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 212 1000 U.S. 1 212 318 2000 Copyright 2002 Bloomberg L.P.
6373-428-0 05-Apr-02 17:56:18

Rating Interbanca (B.ca Pop. Antoniana)

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functional-
ities

<HELP> per spiegazioni, <MENU> per funzioni simili.
Num. <GO> per rating storici

DL18 Corp

CRPR

Opzioni

PROFILO CREDITO

Interbanca SpA

Pag 1/1

Per ulteriori info vedi società madre:

Banca Antoniana Popolare Veneta Sca

MOODYS

- | | |
|----------------------------|--------|
| 1) Previsioni | STABLE |
| 2) Long Term Bank Deposits | Baa1 |
| 3) Senior Unsecured Debt | Baa1 |
| 4) Subordinated Debt | Baa2 |
| 5) Bank Financial Strength | C- |
| 6) Breve term | P-2 |

Australia 61 2 9777 8600

Brazil 5511 3048 4500

Europe 44 20 7330 7500

Germany 49 69 920410

Hong Kong 852 2977 6000

Japan 81 3 3201 8900

Singapore 65 212 1000

U.S. 1 212 318 2000

Copyright 2002 Bloomberg L.P.

G373-428-0 05-Apr-02 18:14:47

Pricing Interbanca (ISIN IT0001385050)

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

	A	B	C	D	E	F	G	H	I	J
1	Interbanca	Coupon do not now Normalized from call (Bond Clean Price from call B19)								
2	ISIN IT0001385050	STRUCTURED NOTE								
3		BOND								
4	Features	Parameters								
5	Notand	100		Rating	AAA					
6	Maturity	20-07-07		Credit Spread	0.75%	< 1la				
7	Trade date	20-04-08	6	Embed Vld	25.50%	< 1la vld				
8	Settlement date (day later)	04-may-08								
9	Time to maturity	430								
10	Payments per year	1								
11	Day count convention	30/360								
12	Last coupon date	20-04-07								
13	Time to next coupon payment	0.370								
14	Yield coupon	3.000%								
15	Cpo = 1 + (1 + Yield) * 360 / (1 + Yield) * 360, 1 + Yield = 3.5%, derive 3.5%									
16										
17	Down Price	91.027								
18	Normal Market	1.4832								
19	Clean Price	91.175								
20										
		Coupon Dates	Adjusted Coupon Dates	Time to (t-1) (T)	Rate (Yield)	Rate (Yield)	Simple Interest Rate	Periodic Yield	Expected Coupon	Discount Factors
		(Start = T, Stop = t)					Rate (Yield) (T-1, T)	Rate (Yield) (T-1, T)		Expected Coupon
21		20-04-07	21-04-07	0.953	0.053022	2.02%	25.50%	25.50%	0.0390728	0.03905
22		20-04-08	20-04-08	1.000	0.053021	3.5800%	25.50%	25.50%	0.0402867	0.03756
23		20-04-09	20-04-09	1.000	0.053020	3.5800%	25.50%	25.50%	0.0416682	0.03614
24		20-04-10	20-04-10	1.000	0.053019	3.5800%	25.50%	25.50%	0.0430869	0.03478
25		20-04-11	20-04-11	1.005	0.053018	3.5800%	25.50%	25.50%	0.0445386	0.03343
26		20-04-12	20-04-12	1.010	0.053017	3.5800%	25.50%	25.50%	0.0460286	0.03208
27		20-04-13	20-04-13	1.015	0.053016	3.5800%	25.50%	25.50%	0.0475486	0.03073
28		20-04-14	20-04-14	1.020	0.053015	3.5800%	25.50%	25.50%	0.0490986	0.02938
29		20-04-15	20-04-15	1.025	0.053014	3.5800%	25.50%	25.50%	0.0506786	0.02803
30		20-04-16	20-04-16	1.030	0.053013	3.5800%	25.50%	25.50%	0.0522886	0.02668
31		20-04-17	20-04-17	1.035	0.053012	3.5800%	25.50%	25.50%	0.0539286	0.02533

Valuation Method

The security is explicitly yielding following practice:
 1) Long / floating interest with floating rate = Embed + 0.5%
 2) Fixed / floating interest with floating rate = Embed + 0.5%
 3) Fixed / floating interest with floating rate = Embed + 0.5%
 4) Fixed / floating interest with floating rate = Embed + 0.5%
 5) Fixed / floating interest with floating rate = Embed + 0.5%
 6) Fixed / floating interest with floating rate = Embed + 0.5%
 7) Fixed / floating interest with floating rate = Embed + 0.5%
 8) Fixed / floating interest with floating rate = Embed + 0.5%
 9) Fixed / floating interest with floating rate = Embed + 0.5%
 10) Fixed / floating interest with floating rate = Embed + 0.5%
 11) Fixed / floating interest with floating rate = Embed + 0.5%
 12) Fixed / floating interest with floating rate = Embed + 0.5%
 13) Fixed / floating interest with floating rate = Embed + 0.5%
 14) Fixed / floating interest with floating rate = Embed + 0.5%
 15) Fixed / floating interest with floating rate = Embed + 0.5%
 16) Fixed / floating interest with floating rate = Embed + 0.5%
 17) Fixed / floating interest with floating rate = Embed + 0.5%
 18) Fixed / floating interest with floating rate = Embed + 0.5%
 19) Fixed / floating interest with floating rate = Embed + 0.5%
 20) Fixed / floating interest with floating rate = Embed + 0.5%
 21) Fixed / floating interest with floating rate = Embed + 0.5%
 22) Fixed / floating interest with floating rate = Embed + 0.5%
 23) Fixed / floating interest with floating rate = Embed + 0.5%
 24) Fixed / floating interest with floating rate = Embed + 0.5%
 25) Fixed / floating interest with floating rate = Embed + 0.5%
 26) Fixed / floating interest with floating rate = Embed + 0.5%
 27) Fixed / floating interest with floating rate = Embed + 0.5%
 28) Fixed / floating interest with floating rate = Embed + 0.5%
 29) Fixed / floating interest with floating rate = Embed + 0.5%
 30) Fixed / floating interest with floating rate = Embed + 0.5%
 31) Fixed / floating interest with floating rate = Embed + 0.5%

Cariplo IntesaBCI (ISIN IT0001207064)

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functionalities

DES

DL18 Corp DES

DESCRIZIONE OBLIGAZIONI INDICIZZATE

Redenominates on 4/ 2/01

CARIPLO

BAVB 6 03/10/13

NOT PRICED

INFO EMITTENTE				IDENTIFICATORI				1) Ridenominazne euro 2) Info ulteriori 3) Tassi var. 4) Identif. 5) Rating 6) Comm/Restrizioni 7) Note personalizzate 8) Info emittente 9) ALLQ 10) Fonte prezzi 11) Titoli associati
Nome INTESABCI SPA				ISIN		IT0001207064		
Tipo Commer Banks Non-US				Italy		120706		
Mercato emissionEURO-ZONE				BB number		II1061870		
INFORMAZIONI TITOLO				RATING				
Paese IT		Valuta EUR		Moody's		NA		
Collaterale		BONDS		S&P		NA		
Calcolo (198)NO CALC-FLOATERS				Fitch		NA		
Scadenza 3/10/2013 Serie 2				AMM EMMIS				
NORMAL				Amm emesso				
Cedola6		VARIABLE ANNUAL		EUR 154,936.80		(M)		
HLV		AL↑↑↑↑FLAT		Qtà circolante				
		ACT/ACT		EUR 154,936.80		(M)		
Data annuncio		3/10/98		Minimi/Incrementi				
Dt godimento		3/10/98		0.01/		0.01		
Imo regolamento		3/10/98		Val nomin.		0.52		
Dt prima cedola		3/10/99		BOOK RUNNER/BORSA				
PzEmiss100.0000								
SENZA PROSPETTO								
				65) DES prec				
				66) Invio allegato				

CPN RATE=8% TO 3/99; 6% TO 3/01; THEREAFTER 14.5% - 12MO IL LIBOR (ACT/360). MAX CPN FROM 3/02=6% (MIN CPN=4%).

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 212 1000 U.S. 1 212 318 2000 Copyright 2002 Bloomberg L.P.
6373-428-0 05-Apr-02 18:56:44

Rating Cariplo IntesaBCI

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functional-
ities

<HELP> per spiegazioni, <MENU> per funzioni simili.
Num. <GO> per rating storici

DL18 Corp

CRPR

Opzioni

PROFILO CREDITO

Cariplo

Pag 1/1

Per ulteriori info vedi socetà madre:

IntesaBci SpA

MOODY'S

- 1) Provisioni POS
- 2) Long Term Bank Deposits A1
- 3) Senior Unsecured Debt A1
- 4) Bank Financial Strength C+
- 5) Breve term P-1

STANDARD & POORS

- 6) LT Foreign Issuer Credit WR
- 7) LT Local Issuer Credit WR
- 8) ST Foreign Issuer Credit WR
- 9) ST Local Issuer Credit WR

FITCH

- 10) Senior Unsecured Debt WR
- 11) Breve term WR

THOMSON BANKWATCH

- 12) Lungo term WR
- 13) Breve term WR

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 212 1000 U.S. 1 212 318 2000

Germany 49 69 920410
Copyright 2002 Bloomberg L.P.
G373-428-0 05-Apr-02 18:58:10

Pricing Cariplo IntesaBCI (ISIN IT0001207064)

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

	A	B	C	D	E	F	G	H	I	J
1	Cariplo IntesaBCI	Caution: do not move Nominal from cell B5 and Clean Price from cell B19								
2	ISIN IT0001207064		REVERSE FLOATER							
3			INPUT							
4	Features:			Parameters						
5	Nominal	100		Rating	Bank A1					
6	Maturity	10-mar-08		Credit Spread	0.42% <- flat					
7	Trade date	28-feb-03	6	Earibor Vol	24.31% <- flat vol					
8	Settlement date (2 days later)	04-mar-03								
9	Time to maturity	5.0173								
10	# payments per year	1								
11	Day-count convention	1	act/ACT							
12	Last coupon date	10-mar-02								
13	Time from last coupon payment	0.984								
14	First coupon	6.000%								
15	Cpn = 14.5%-12moLibor, max cpn = 6%, min cpn = 4%									
16										
17	Gros Price	113.948								
18	Accrued Interest	5.901								
19	Clean Price	108.047								
20										
21	Coupon Dates	day of the week (Sat = 7, Sun = 1)	Adjusted Coupon Dates	Tenor $\alpha(T(i-1), T(i))$	Time	Risky Discount Factor	Simple Forward Rate $F(0, T(i-1), T(i))$	Fwd Fwd Vol $\sigma(F(t, T(i-1), T(i)))$	Expected Coupon	Discount Factor x Expected Coupon
22	10-mar-02	1	11-mar-02							
23	10-mar-03	2	10-mar-03	0.9972603	0.016438	0.999	not relevant	not relevant	0.05983561644	0.05980194
24	10-mar-04	4	10-mar-04	1.0000000	1.017784	0.963	0.03314	24.31%	0.06000000000	0.05779923
25	10-mar-05	5	10-mar-05	1.0000000	2.017336	0.925	0.03655	24.31%	0.05999902426	0.05552652
26	10-mar-06	6	10-mar-06	1.0000000	3.017112	0.887	0.03847	24.31%	0.05993913410	0.05319227
27	10-mar-07	7	12-mar-07	1.0054795	4.022453	0.850	0.03953	24.31%	0.06008904897	0.05107066
28	10-mar-08	2	10-mar-08	0.9945355	5.017336	0.814	0.04012	24.31%	1.05921144081	0.86208960

Valuation method
The security is replicated by the following portfolio:
1) long 1 cap with strike 10.5%
2) short 1 cap with strike 8.5%
3) long a coupon bond with fixed rate 6%
coupon = $(12\text{moLibor} - 10.5\%)^+ - (12\text{moLibor} - 8.5\%)^+ + 6\%$
We can price the 2 caps with Black

Hedging Instrument: a swap

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

IRS Caution: do not move Nominal from cell B5 and Clean Price from cell B19

ISIN XYZ

SWAP

Features:

Swap type (payer=1, receiver=-1)	-1
Nominal	100
Trade date	28-feb-03 6
Settlement date (2 business days)	04-mar-03 3
Inception	07-oct-02 2
Maturity	07-oct-10 5
Swap rate	4.00%

Floating leg: # payments per year	1
Floating leg: basis	2
Last coupon date floating leg	07-oct-02
Time from last floating payment	0.405
First floating payment	2.12%
	0.8598%

Gross Price	2.682
Accrued Interest	0.762
Clean Price	1.920

Floating Leg	0.2522
Fixed Leg	0.2790
Swap	0.0268

Fixed leg: # payments per year	2
Fixed leg: basis	1
Last coupon date fixed leg	07-oct-02
Time from last coupon payment	0.4055
First fixed payment	4.00%

FLOATING LEG	
$P(t_0, T_1)$	0.98
$P(t, T_1)$	0.98
$P(t, T_2)$	0.75
Floating leg	0.2522

Valuation Method

Payer IRS: Value = Floating Leg - Fixed Leg

Receiver IRS: Value = Fixed Leg - Floating Leg

INPUT

$$\text{accrued interest} = \text{interest due in full period} \times \frac{\text{number of days since last coupon date}}{\text{number of days in period between coupon payments}}$$

Hedging Instrument: the floating leg

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functionalities

FLOATING LEG									
Payment Dates	Day of the week (Sat = 7, Sun = 1)	Adjusted Coupon Dates	Tenor at $T(t-1), T(t)$	Time $T(t)$	Discount Factor $P(0, T(t))$	Simple Forward Rate $F(0, T(t)-1, T(t))$	Expected Floating Payment	Discounted Expected Floating Payment	
04-mar-03	3	04-mar-03		0.0000					
07-oct-03	3	07-oct-03	1.0139	0.5945	0.9814		0.02150	0.02110	
07-oct-04	5	07-oct-04	1.0167	1.5951	0.9479	0.03479	0.03537	0.03352	
07-oct-05	6	07-oct-05	1.0139	2.5949	0.9133	0.03728	0.03780	0.03453	
07-oct-06	7	07-oct-06	1.0139	3.5948	0.8789	0.03862	0.03916	0.03442	
07-oct-07	1	08-oct-07	1.0167	4.5975	0.8431	0.03936	0.04062	0.03382	
07-oct-08	3	07-oct-08	1.0139	5.5949	0.8124	0.03966	0.04021	0.03267	
07-oct-09	4	07-oct-09	1.0139	6.5948	0.7808	0.03998	0.04054	0.03165	
07-oct-10	5	07-oct-10	1.0139	7.5948	0.7503	0.04010	0.04066	0.03051	
							PV(floating Leg)	0.35221	

Hedging Instrument: the fixed leg

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functional-
ities

FIXED LEG							
Payment Dates	day of the week (Sat = 7, Sun = 1)	Adjusted Coupon Dates	Tenor $a(T(i-1), T(i))$	Time $T(i)$	Discount Factor $P(0, T(i))$	Payment	Discount Factor x Payment
04-mar-03	3	04-mar-03		0.0000			
07-apr-03	2	07-apr-03	0.4986	0.0932	0.9972	0.01995	0.01989
07-oct-03	3	07-oct-03	0.5014	0.5945	0.9814	0.02005	0.01968
07-apr-04	4	07-apr-04	0.5000	1.0944	0.9649	0.02000	0.01930
07-oct-04	5	07-oct-04	0.5000	1.5951	0.9479	0.02000	0.01896
07-apr-05	5	07-apr-05	0.4986	2.0940	0.9307	0.01995	0.01856
07-oct-05	6	07-oct-05	0.5014	2.5949	0.9133	0.02005	0.01832
07-apr-06	6	07-apr-06	0.4986	3.0938	0.8961	0.01995	0.01787
07-oct-06	7	07-oct-06	0.5014	3.5948	0.8789	0.02005	0.01763
07-apr-07	7	07-apr-07	0.4986	4.0936	0.8620	0.01995	0.01719
07-oct-07	1	08-oct-07	0.5041	4.5975	0.8451	0.02016	0.01704
07-apr-08	2	07-apr-08	0.4973	5.0940	0.8287	0.01989	0.01648
07-oct-08	3	07-oct-08	0.5000	5.5949	0.8124	0.02000	0.01625
07-apr-09	3	07-apr-09	0.4986	6.0939	0.7965	0.01995	0.01589
07-oct-09	4	07-oct-09	0.5014	6.5948	0.7808	0.02005	0.01566
07-apr-10	4	07-apr-10	0.4986	7.0938	0.7654	0.01995	0.01527
07-oct-10	5	07-oct-10	0.5014	7.5948	0.7503	0.02005	0.01505
						PV(fixed Leg)	0.27903

Compute Sensitivities

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

SENSITIVITY ANALYSIS WITH RESPECT TO PARALLEL SHIFTS IN THE TS

FULL EVALUATION

Nelson Siegel parameters	
Trade date	28-feb-03
beta0	0.0400
beta1	-0.0100
beta2	0.0000
kappa	0.6000
current spot rate	3.00%

ΔR	0.01%	
R - ΔR	3.99%	-ΔR
R + ΔR	4.01%	+ΔR

Remark: all nominals are set by default at 100 in the subsequent spreadsheets

INPUT

UPDATE BY MACRO GET_DV01

Starting sheet 7 <- hedging instrument
Nb_products 4

GET_DV01

Clear

MACRO GET_DV01:

We have 1 hedging instrument and N portfolio's securities
1) Given current TS $R = R(\text{beta0})$, writes clean prices $V(R)$ in spreadsheet 'PORTFOLIO', from cell B19 of pricing spreadsheets
2) Set $R = R - \Delta R$ and writes clean prices $V(R - \Delta R)$ in spreadsheet 'PORTFOLIO', from cell B19 of pricing spreadsheets
3) Set $R = R + \Delta R$ and writes clean prices $V(R + \Delta R)$ in spreadsheet 'PORTFOLIO', from cell B19 of pricing spreadsheets

Sometimes, the DV01 is computed derivative by the following inco

$$DV01 = -\frac{B(y^*)}{y^*}$$

HEDGING INSTRUMENT							
N	FACE VALUE	NOMINAL	PRICE	VALUE	$V(y - \Delta y)$	$V(y + \Delta y)$	DV01
1	1,000,000	100	1.920169763	19,202	1.980	1.858	0.06118365
							$\frac{B(H24-G24)}{(100000*2)*SC513}$
							$\frac{B(I24-D24)*C24}{100}$

Portfolio Value (Clean Value)	20,155,448	=SOMMA(F31:F34)
Portfolio bpv	5,983.678	=MATR.SOMMA.PRODOTTO(I31:I34;C31:C34)/100

PORTFOLIO							
N	FACE VALUE	NOMINAL	PRICE	VALUE	$V(y - \Delta y)$	$V(y + \Delta y)$	DV01
1	5,000,000	100	97.634	4,881,677	97.6837	97.5794	0.052123
2	5,000,000	100	99.238	4,962,911	99.2396	99.2364	0.001610
3	5,000,000	100	98.171	4,908,525	98.1859	98.1531	0.016384
4	5,000,000	100	108.047	5,402,335	108.0941	107.9930	0.049557
					$\frac{B(C34-D34)*E34}{100}$	$\frac{B(H34-G34)}{(100000*2)*SC513}$	$\frac{B(I34-D34)*C34}{100}$

Set Up the hedging strategy

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

HEDGING STRATEGY

Recompose the portfolio

$$n1 * PV + n2 * SV = V + SV$$

$$n1 * BPV1 + n2 * BPV2 = 0$$

Build the linear system

PV

SV

n1

=

PV+SV

BPV1

BPV2

n2

0

Legend

Build the linear system

PV: portfolio value

SV: swap value

20,155,448

19,202

n1

=

20,174,649

BPV1: portfolio BPV

BPV2: swap bpv

5,984

612

n2

0

Solution

n1

1.010366349

=SE(D43=0;"",MATR.PRODOTTO(MATR.INVERSA(D42:E43);I42:I43))

n2

-9.881246643

=SE(D43=0;"",MATR.PRODOTTO(MATR.INVERSA(D42:E43);I42:I43))

Portfolio Analysis

No hedge

Hedge

n1 (bond)

1

1.0104

n2 (swap)

1

-9.8812

Value

20,174,649

20,174,649

Shift up

20,167,773

20,174,513

Shift up

20,179,740

20,174,513

DV01

-5,984

0.00

BPV

-0.60

0.00

Set Up the hedging strategy against different term structure movements

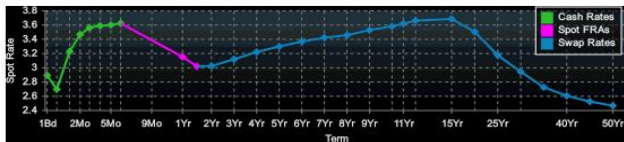
Laboratory Session	beta0	Swap	Bond1	Bond2	Bond3	Bond4	Portfolio
Gianluca Fusai	0.04	1.9202	97.6335	99.2582	98.1705	108.0467	
	0.0401	1.8590	97.5814	99.2566	98.1541	107.9971	
	0.0399	1.9814	97.6857	99.2598	98.1869	108.0963	
Introduction	Derivative	-611.8504	-521.2366	-16.0989	-163.8174	-495.5772	
The Portfolio	DV01	0.0612	0.0521	0.0016	0.0164	0.0496	5983.651291
Tools	hedge ratio	97796	to hedge only against parallel shifts				
Nelson Siegel	beta1	Swap	Bond1	Bond2	Bond3	Bond4	Portfolio
	-0.01	1.920169763	97.63353217	99.25821661	98.17050706	108.0466953	
Market Information	-0.010001	1.920278408	97.63368374	99.25823215	98.17057771	108.046859	
	-0.009999	1.920061119	97.63338059	99.25820106	98.1704364	108.0465315	
Corporate Bonds	Derivative	1.0864	1.5158	0.1555	0.7065	1.6379	
	DV01	-0.0001	-0.0002	0.0000	-0.0001	-0.0002	-20.07807834
Sensitivity Analysis and Hedging	hedge ratio	184806	to hedge only against slope shifts				
							very small sensitivity to slope chan
New Bloomberg functionalities	beta2	Swap	Bond1	Bond2	Bond3	Bond4	Portfolio
	0	1.920169763	97.63353217	99.25821661	98.17050706	108.0466953	
	0.0001	1.897689945	97.61196842	99.25811702	98.16429257	108.0246165	
	-0.0001	1.942655567	97.65510094	99.25831619	98.17670134	108.068777	
	Derivative	-224.8281	-215.6626	-0.9958	-62.0439	-220.8022	
	DV01	0.0225	0.0216	0.0001	0.0062	0.0221	2497.522368
	hedge ratio	111086	to hedge only against curvature shifts				

New Bloomberg data: swdf

<HELP> for explanation.

Equity **SWDF**

1) Save			2) Refresh			3		
Short End			Middle			Long End		
Cash Rates	Start	End	Spot FRAs	Start	End	Swap Rates	Start	End
	1 Bd	6 MO	<input checked="" type="checkbox"/> Spot FRAs	6 MO	18 MO		2 YR	50 YR
Term	Bid	Ask	Term	Bid	Ask	Term	Bid	Ask
1 Bd	2.89600	2.89600	FRA 4X10	2.6530	2.6530	1 YR	3.1200	3.1545
1 WK	2.69700	2.69700	FRA 5X11	2.5490	2.5490	18 MO	3.0210	3.0400
1 MO	3.22900	3.22900	FRA 6X12	2.5530	2.5720	2 YR	3.0270	3.0270
2 MO	3.46700	3.46700	FRA 7X13	2.5890	2.6390	3 YR	3.1180	3.1180
3 MO	3.56300	3.56300	FRA 8X14	2.5910	2.6410	4 YR	3.2150	3.2150
4 MO	3.58900	3.58900	FRA 9X15	2.5930	2.6430	5 YR	3.2900	3.2903
5 MO	3.60100	3.60100	FRA 10X16	2.6250	2.6750	6 YR	3.3540	3.3540
6 MO	3.62400	3.62400	FRA 11X17	2.6880	2.7300	7 YR	3.4050	3.4060
7 MO	3.64100	3.64100	FRA 12X18	2.7100	2.7540	8 YR	3.4370	3.4510
8 MO	3.65500	3.65500	FRA 18X24	2.9090	2.9590	9 YR	3.5020	3.5033
ACT/360			ACT/360 Contributor CMPN			30U/360, A Contributor CMPN		



* Illiquid contracts are not used in curve building.

\20) Configuration / \21) Stripped Curve / \22) Forward Analysis / \23) Curve Horizon / \24) Real Time Rates /

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2008 Bloomberg Finance L.P.
 05-Dec-2008 14:41:27

New Bloomberg data: vcub

Laboratory
Session

Gianluca
Fusai

Introduction

The
Portfolio

Tools

Nelson
Siegel

Market
Information

Corporate
Bonds

Sensitivity
Analysis
and
Hedging

New
Bloomberg
functional-
ities

<HELP> for explanation.
File download complete.ss.

N311c Corp **VCUB**

Interest Rate Volatility Cube

Save		Refresh		Detail View		Contributed Cap Market							
Side	Mid	Contributors				BBIR	Date 10/24/02						
Term	Strike	ATM	1.75 %	2.00 %	2.25 %	2.50 %	3.00 %	3.50 %	4.00 %	5.00 %	6.00 %	7.00 %	
1 YR	3.05	25.50	38.05	34.50	31.55	29.15	25.80	24.30	23.95	24.80	25.95	27.00	
2 YR	3.42	22.70	36.50	33.35	30.70	28.40	24.90	22.60	21.12	20.10	20.38	20.98	
3 YR	3.76	20.60	34.75	32.05	29.70	27.60	24.27	21.80	20.00	18.12	17.70	17.90	
4 YR	4.04	19.10	33.23	30.77	28.65	26.77	23.62	21.18	19.32	17.05	16.18	16.00	
5 YR	4.25	18.00	31.95	29.73	27.75	26.02	23.07	20.70	18.82	16.43	15.25	14.83	
6 YR	4.43	19.20	35.07	32.45	30.20	28.18	24.85	22.32	20.45	18.12	17.10	16.77	
7 YR	4.57	16.40	32.20	29.88	27.82	26.02	22.98	20.48	18.40	15.22	13.80	13.90	
8 YR	4.69	16.70	32.82	30.45	28.40	26.57	23.48	20.98	18.93	15.90	14.60	14.53	
9 YR	4.78	16.25	31.95	29.70	27.73	26.00	23.05	20.62	18.65	15.72	14.35	14.15	
10 YR	4.86	14.60	30.05	27.95	26.12	24.52	21.77	19.43	17.40	14.17	12.60	12.65	
12 YR	4.98	14.10	28.82	26.88	25.18	23.68	21.12	18.93	17.02	14.03	12.50	12.30	
15 YR	5.11	13.70	27.88	25.98	24.38	22.98	20.52	18.48	16.68	13.88	12.40	12.05	
20 YR	5.21	13.10	26.62	24.82	23.27	21.98	19.68	17.73	16.07	13.45	12.03	11.60	

Created by **DAVIDE MASPERO** Currency **EUR**
 Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2009 Bloomberg Finance L.P.
 0 02-Feb-09 18:24:46

New Bloomberg data: cds

Laboratory Session

Gianluca Fusai

Introduction

The Portfolio

Tools

Nelson Siegel

Market Information

Corporate Bonds

Sensitivity Analysis and Hedging

New Bloomberg functionalities

UCIM CDS EUR SR Curve
99<GO> to save current selections

Pricing Source **CMAN**

Region, Sector **Europe** **Banks**

Page 1/3 CDS Switch Historical Analysis

Ref Names **UniCredit SpA**

Currency **EUR** Debt Type **Senior**

Index **DES**

Buy-Sell

Historical CDS Switch Spreads

Curr CDS Spreads

Strategy	Today	1 Day	1 Wk	1 Mo	3 Mo	6 Mo	1 Yr	1Yr Hi	1Yr Lo	Maturity	(bps)
1) 1-3	9.3	9.3	6.7	6.2	21.6	9.1	7.3	47.8	6.2	6 Mo	+133.0
2) 1-5	12.9	12.9	9.3	8.7	33.3	17.2	14.6	71.2	8.7	1 Yr	133.0
3) 3-5	3.6	3.6	2.6	2.5	11.7	8.1	7.3	29.2	2.5	2 Yr	138.4
4) 3-7	4.9	4.9	3.7	0.5	14.3	10.3	11.3	35.3	0.5	3 Yr	142.3
5) 3-10	5.9	5.9	4.4	-2.5	14.9	9.9	12.5	42.7	-2.7	4 Yr	144.5
6) 5-7	1.3	1.3	1.1	-2.0	2.6	2.2	4.0	11.5	-3.3	5 Yr	145.9
7) 5-10	2.3	2.3	1.8	-5.0	3.2	1.8	5.2	23.0	-9.7	7 Yr	147.2
8) 7-10	1.0	1.0	0.7	-3.0	0.6	-0.4	1.2	11.5	-9.9	10 Yr	148.2

+ interpolated

Buy 5 Yr/Sell 7 Yr



Method **Equal Notional** **Switch Spread(bps)** **1.3**

	Security	Curr Spread	Notional	SprdDV01
Buy	5 Yr CDS	145.9	10.00MM	-4,443.8
Sell	7 Yr CDS	147.2	10.00MM	5,868.3

Further Analysis

10) HS Historical Price Spread

11) HGCS CDS Switch Analysis

30) Spreads(CDSH)	40) Term Structure(CDHT)	50) Switch(CHSA)	60) Sector(GCDS)
Australia 61 2 9777 8600	Brazil 5511 3048 4500	Europe 44 20 7330 7500	Germany 49 69 9204 1210
Japan 81 3 3201 8900	Singapore 65 6212 1000	U.S. 1 212 318 2000	Hong Kong 852 2977 6000

Copyright 2008 Bloomberg Finance L.P.
05-Dec-2008 16:50:21

Arrivederci