TAB: NELSON-SIEGEL TERM STRUCTURE

Yield Sample

Sample count	
Original	19
Final	14

Output

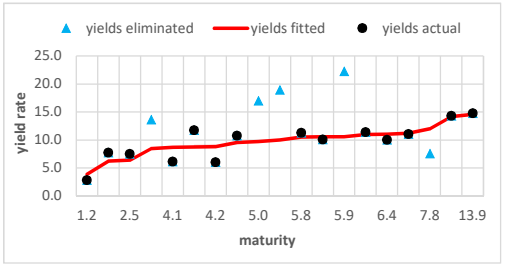
α	β_0	β_1	β_2
0.33	18.49	-17.47	-0.90

RMSE 1.49

Calculator:

Parameter	Object
tenors:	java.util.ArrayList@Sun, 24 Jun 2018 13:34:10:254..574273E
yields:	java.util.ArrayList@Sun, 24 Jun 2018 13:34:10:254..2680003
parameters:	java.util.LinkedHashMap@Sun, 24 Jun 2018 13:33:03:440..2
calculator:	jeconkr.finance.FSTP.lib.model.yts.calculator.CalculatorNels

Yields and fitted yields



Original sample

#	tenor	yield actual	index in final sample	yield actual matched	yield fitted matched
1	1.15	2.80	1	2.80	3.85
2	2.37	7.67	2	7.67	6.19
3	2.49	7.47	3	7.47	6.39
4	3.90	13.61		-1.00	8.45
5	4.07	6.11	4	6.11	8.66
6	4.11	11.68	5	11.68	8.72
7	4.15	5.95	6	5.95	8.76
8	4.82	10.74	7	10.74	9.53
9	4.99	16.95		-1.00	9.70
10	5.23	18.92		-1.00	9.95
11	5.82	11.23	8	11.23	10.51
12	5.90	10.02	9	10.02	10.58
13	5.90	22.21		-1.00	10.58
14	6.32	11.36	10	11.36	10.94
15	6.40	9.97	11	9.97	11.01
16	6.61	10.99	12	10.99	11.17
17	7.78	7.51		-1.00	12.00
18	12.53	14.30	13	14.30	14.17
19	13.90	14.76	14	14.76	14.57

Final sample ***R2(α)***

tenor	yield actual	yield fitted	res	α	R2
1.15	2.80	3.85	-1.05	0.33	0.78
2.37	7.67	6.19	1.48	0.33	0.78
2.49	7.47	6.39	1.08	0.33	0.78
4.07	6.11	8.66	-2.55	0.33	0.78
4.11	11.68	8.72	2.96	0.33	0.78
4.15	5.95	8.76	-2.81	0.33	0.78
4.82	10.74	9.53	1.21	0.33	0.78
5.82	11.23	10.51	0.72	0.33	0.78
5.90	10.02	10.58	-0.56	0.33	0.78
6.32	11.36	10.94	0.42	0.33	0.78
6.40	9.97	11.01	-1.03	0.33	0.78
5.90	10.02	10.58	-0.18	0.33	0.78
12.53	14.30	14.17	0.13	0.33	0.78
13.90	14.76	14.57	0.19	0.33	0.78

Available methods	α	**Parameter**	Value
Diebold-Li	0.73	method	*Fabozzi*
Fabozzi	0.33	screen-count	5
Nelson-Siegel	[0, 1]	Date	#REF!
Ridge-OLS	[0, 1]	Row index	#REF!

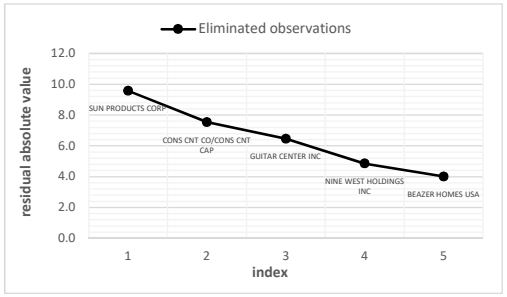
Eliminated observations

#	residuals	index	yield - ST	yield - LT
1	9.57	13.00	-3.35	11.26
2	7.54	10.00	-1.41	12.55
3	6.46	9.00	0.11	14.32
4	4.84	4.00	1.43	16.15
5	4.00	17.00	1.76	17.83

Elimination index mapping

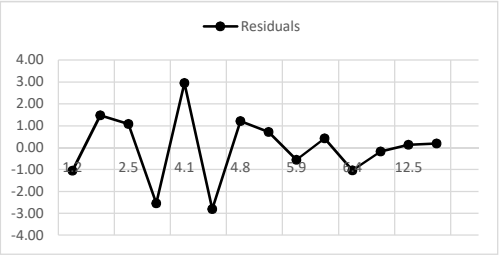
#	final	original
1	1	1
2	2	2
3	3	3
4	4	5
5	5	6
6	6	7
7	7	8
8	8	11
9	9	12
10	10	14
11	11	15
12	12	16
13	13	18
14	14	19

Eliminated observations



1	EK417798 Corp	SUN PRODUCTS CORP
2	EK056998 Corp	CONS CNT CO/CONS CNT
3	EJ262141 Corp	GUITAR CENTER INC
4	EI724825 Corp	NINE WEST HOLDINGS IN
5	DD112817 Corp	BEAZER HOMES USA

Residuals



TAB: YIELD FITTED TERM STRUCTURE

	α	β_0	β_1	β_2
coefficient	0.33	18.49	-17.47	-0.90

Full term structure

Maturity	level	slope	curvature	yield
0.01	1.00	1.00	0.00	1.05
1	1.00	0.85	0.13	3.51
2.0	1.00	0.73	0.22	5.54
3.0	1.00	0.63	0.26	7.21
4.0	1.00	0.55	0.29	8.58
5.0	1.00	0.49	0.30	9.72
6.0	1.00	0.43	0.30	10.67
7.0	1.00	0.39	0.29	11.46
8.0	1.00	0.35	0.28	12.14
9.0	1.00	0.32	0.27	12.71
10.0	1.00	0.29	0.25	13.20
11.0	1.00	0.27	0.24	13.63
12.0	1.00	0.25	0.23	13.99
13.0	1.00	0.23	0.21	14.31
14.0	1.00	0.21	0.20	14.60
15.0	1.00	0.20	0.19	14.84
16.0	1.00	0.19	0.18	15.06
17.0	1.00	0.18	0.17	15.26
18.0	1.00	0.17	0.16	15.43
19.0	1.00	0.16	0.16	15.59
20.0	1.00	0.15	0.15	15.74
21.0	1.00	0.14	0.14	15.87
22.0	1.00	0.14	0.14	15.98
23.0	1.00	0.13	0.13	16.09
24.0	1.00	0.12	0.12	16.19
25.0	1.00	0.12	0.12	16.28
26.0	1.00	0.12	0.12	16.37
27.0	1.00	0.11	0.11	16.45
28.0	1.00	0.11	0.11	16.52
29.0	1.00	0.10	0.10	16.59
30.0	1.00	0.10	0.10	16.65

Standard term structure

Maturity	level	slope	curvature	yield
0.25	1.00	0.96	0.04	1.69
0.5	1.00	0.92	0.07	2.33
1	1.00	0.85	0.13	3.51
2	1.00	0.73	0.22	5.54
3	1.00	0.63	0.26	7.21
4	1.00	0.55	0.29	8.58
5	1.00	0.49	0.30	9.72
7	1.00	0.39	0.29	11.46
8	1.00	0.35	0.28	12.14
9	1.00	0.32	0.27	12.71
10	1.00	0.29	0.25	13.20
15	1.00	0.20	0.19	14.84
20	1.00	0.15	0.15	15.74
25	1.00	0.12	0.12	16.28
30	1.00	0.10	0.10	16.65

Sample-based term structure

Maturity	level	slope	curvature	yield
1.15	1.00	0.83	0.15	3.85
2.37	1.00	0.69	0.24	6.19
2.49	1.00	0.68	0.24	6.39
3.90	1.00	0.56	0.29	8.45
4.07	1.00	0.55	0.29	8.66
4.11	1.00	0.54	0.29	8.72
4.15	1.00	0.54	0.29	8.76
4.82	1.00	0.50	0.30	9.53
4.99	1.00	0.49	0.30	9.70
5.23	1.00	0.47	0.30	9.95
5.82	1.00	0.44	0.30	10.51
5.90	1.00	0.44	0.30	10.58
5.90	1.00	0.44	0.30	10.58
6.32	1.00	0.42	0.30	10.94
6.40	1.00	0.41	0.29	11.01
6.61	1.00	0.40	0.29	11.17
7.78	1.00	0.36	0.28	12.00
12.53	1.00	0.24	0.22	14.17
13.90	1.00	0.21	0.20	14.57

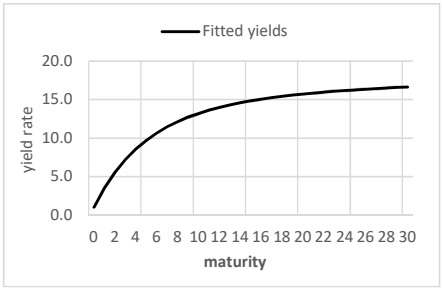
Yields estimated from the term structure

Long-term yield (level)	**18.49**
Short-term yield (level + slope)	**1.02**
Long-term premium (-slope)	**17.47**

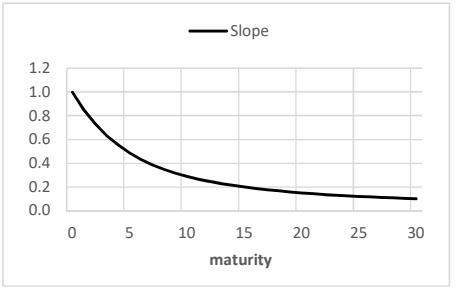
Actual yields

Longest maturity yield (level)	14.76
Shortest maturity yield	2.80
Long-term premium	11.96
Mid-term maturity (τ)	4.80

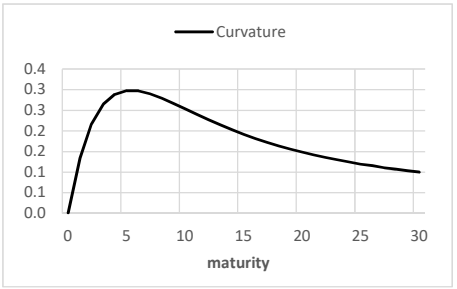
Fitted yields



Slope



Curvature



TAB: SAMPLE DATA

Original Sample

#	Transaction-specific Bloomberg code	Issuer Name	Tenor	Yield	is eliminated
1	EF656286 Corp	BEAZER HOMES USA	1.15	2.80	0
2	EF062853 Corp	MCCLATCHY CO	2.37	7.67	0
3	EI810032 Corp	DJO FIN LLC/DJO FIN CORP	2.49	7.47	0
4	EK227300 Corp	NINE WEST HOLDINGS INC	3.90	13.61	1
5	EI724825 Corp	BEAZER HOMES USA	4.07	6.11	0
6	EK056164 Corp	NORANDA ALUMINUM ACQUISI	4.11	11.68	0
7	EK354818 Corp	BEAZER HOMES USA	4.15	5.95	0
8	EK048683 Corp	URBAN ONE INC	4.82	10.74	0
9	EK147177 Corp	GUITAR CENTER INC	4.99	16.95	1
10	EJ262141 Corp	CONS CNT CO/CONS CNT CAP	5.23	18.92	1
11	EK056998 Corp	BIOSCRIP INC	5.82	11.23	0
12	EJ587873 Corp	CERIDIAN HCM HOLDING INC	5.90	10.02	0
13	EJ587103 Corp	SUN PRODUCTS CORP	5.90	22.21	1
14	EK417798 Corp	BWAY HOLDING CO	6.32	11.36	0
15	EK054663 Corp	BEAZER HOMES USA	6.40	9.97	0
16	EK586550 Corp	TIBCO SOFTWARE INC	6.61	10.99	0
17	EJ767352 Corp	BEAZER HOMES USA	7.78	7.51	1
18	DD112817 Corp	MCCLATCHY CO	12.53	14.30	0
19	EC117098 Corp	MCCLATCHY CO	13.90	14.76	0

Final Sample

#	Transaction-specific Bloomberg code	Issuer Name	Tenor	Yield
1	EF656286 Corp	BEAZER HOMES USA	1.15	2.80
2	EF062853 Corp	MCCLATCHY CO	2.37	7.67
3	EI810032 Corp	DJO FIN LLC/DJO FIN CORP	2.49	7.47
4	EI724825 Corp	BEAZER HOMES USA	4.07	6.11
5	EK056164 Corp	NORANDA ALUMINUM ACQU	4.11	11.68
6	EK354818 Corp	BEAZER HOMES USA	4.15	5.95
7	EK048683 Corp	URBAN ONE INC	4.82	10.74
8	EK056998 Corp	BIOSCRIP INC	5.82	11.23
9	EJ587873 Corp	CERIDIAN HCM HOLDING INC	5.90	10.02
10	EK417798 Corp	BWAY HOLDING CO	6.32	11.36
11	EK054663 Corp	BEAZER HOMES USA	6.40	9.97
12	EK586550 Corp	TIBCO SOFTWARE INC	6.61	10.99
13	DD112817 Corp	MCCLATCHY CO	12.53	14.30
14	EC117098 Corp	MCCLATCHY CO	13.90	14.76

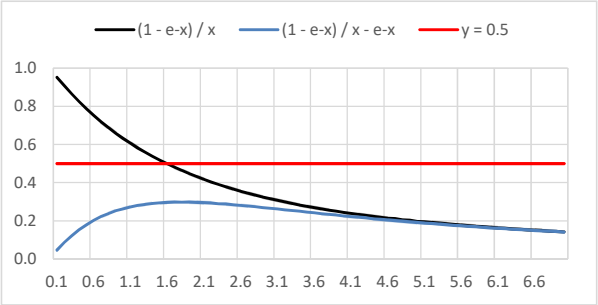
TAB: CALCULATION OF CURVATURE PROXY USING YIELDS

dx 0.1

τ: $(1 - e^{-x}) / x = 0.5$

#	x	$(1 - e^{-x}) / x$	$(1 - e^{-x}) / x - e^{-x}$	y = 0.5
1	0.1	0.952	0.047	0.500
2	0.2	0.906	0.088	0.500
3	0.3	0.864	0.123	0.500
4	0.4	0.824	0.154	0.500
5	0.5	0.787	0.180	0.500
6	0.6	0.752	0.203	0.500
7	0.7	0.719	0.223	0.500
8	0.8	0.688	0.239	0.500
9	0.9	0.659	0.253	0.500
10	1	0.632	0.264	0.500
11	1.1	0.606	0.274	0.500
12	1.2	0.582	0.281	0.500
13	1.3	0.560	0.287	0.500
14	1.4	0.538	0.292	0.500
15	1.5	0.518	0.295	0.500
16	**1.6**	**0.499**	**0.297**	**0.500**
17	1.7	0.481	0.298	0.500
18	1.8	0.464	0.298	0.500
19	1.9	0.448	0.298	0.500
20	2	0.432	0.297	0.500
21	2.1	0.418	0.295	0.500
22	2.2	0.404	0.293	0.500
23	2.3	0.391	0.291	0.500
24	2.4	0.379	0.288	0.500
25	2.5	0.367	0.285	0.500
26	2.6	0.356	0.282	0.500
27	2.7	0.345	0.278	0.500
28	2.8	0.335	0.275	0.500
29	2.9	0.326	0.271	0.500
30	3	0.317	0.267	0.500
31	3.1	0.308	0.263	0.500
32	3.2	0.300	0.259	0.500
33	3.3	0.292	0.255	0.500
34	3.4	0.284	0.251	0.500
35	3.5	0.277	0.247	0.500
36	3.6	0.270	0.243	0.500
37	3.7	0.264	0.239	0.500
38	3.8	0.257	0.235	0.500
39	3.9	0.251	0.231	0.500
40	4	0.245	0.227	0.500
41	4.1	0.240	0.223	0.500
42	4.2	0.235	0.220	0.500
43	4.3	0.229	0.216	0.500
44	4.4	0.224	0.212	0.500
45	4.5	0.220	0.209	0.500
46	4.6	0.215	0.205	0.500
47	4.7	0.211	0.202	0.500
48	4.8	0.207	0.198	0.500
49	4.9	0.203	0.195	0.500
50	5	0.199	0.192	0.500
51	5.1	0.195	0.189	0.500
52	5.2	0.191	0.186	0.500
53	5.3	0.188	0.183	0.500
54	5.4	0.184	0.180	0.500
55	5.5	0.181	0.177	0.500
56	5.6	0.178	0.174	0.500
57	5.7	0.175	0.172	0.500
58	5.8	0.172	0.169	0.500
59	5.9	0.169	0.166	0.500
60	6	0.166	0.164	0.500
61	6.1	0.164	0.161	0.500
62	6.2	0.161	0.159	0.500
63	6.3	0.158	0.157	0.500
64	6.4	0.156	0.154	0.500
65	6.5	0.154	0.152	0.500
66	6.6	0.151	0.150	0.500
67	6.7	0.149	0.148	0.500
68	6.8	0.147	0.146	0.500
69	6.9	0.145	0.144	0.500
70	7	0.143	0.142	0.500

Method	α	τ
Diebold-Li	0.73	2.192
Fabozzi	0.33	4.800
Selected	**0.33**	**4.800**



TAB: CONFIGURATION FILE **Calculation enabled** **TRUE**

Test connection host: home-pc; user: Konstantin Rybakov; key: null

Term structure estimation methods	**Term structure output keys**		**Alpha (α) range**	
Diebold-Li	TS-coeffs	Array of term structure regression coefficients	minimum	0.1
Fabozzi	TS-term-structure	Term structure yields	maximum	1
Nelson-Siegel	TS-elimination-data	Elimnated sample observations	delta	0.05
Ridge-OLS	TS-index-mapping	Mapping between the indices of original and final samples		
	TS-R2	Mapping sample index => R2 (term structure ols)		

Array formula cell address	number of rows	number of cols	Description
'calc'!$I$12	14	4	Final sample and term structure
'calc'!$N$12	18	2	R2(α) sequence of values
'calc'!$R$21	5	4	Elimination output array
'calc'!$X$21	14	2	Index mapping for the final sample

Package: IRB

Available functions for term structure estimation:

CalculatorNelsonSiegel calc = calcTS(Map<Double, Double> sample, String method)
where sample is the mapping t => y[t] of maturity term into related yield rate and method parameter is the method used to estimate the term structure. The list of methods includes:

Diebold-Li
Fabozzi
Nelson-Siegel
Ridge-OLS

double[][] (double[]) CalculatorNelsonSiegel calc, String key)
where key represents the key for a specific retrieved field. The following keys can be used:
1. **TS-coeffs**: coefficients of the term structure (as a list (α, β_0, β_1, β_2);
2. **TS-yields-fitted:** fitted term structure values;
3. **TS-R2**: the values R2(α) for a grid of α values;