

Contents

Preface	xiii
Acknowledgments	xvii
List of Abbreviations	xix
1 An Introduction to Swaps	1
1.1 Overview	1
1.2 Swaps	3
1.2.1 Fixed-Floating Swaps	4
1.2.2 Basis Swaps	28
1.2.3 Cross-Currency Swaps	34
2 The Risk Characteristics and the Traditional Uses of Swaps	40
2.1 Interest Rate Risk	40
2.1.1 PV01	43
2.2 Spread Risk	48
2.2.1 A Closer Look at Swap Spreads	50
2.3 Currency Risk	57
2.4 Counterparty Risk	58
2.5 Traditional Uses of Swaps	63
2.5.1 New Issue Hedging	63
2.5.2 Asset Swaps	68
2.5.3 Balance Sheet Management	70
3 The Pricing of Swaps	76
3.1 Where Do Swap Rates Come From?	76

CONTENTS

3.1.1	The Link Between Swap Rates and Eurodollar Futures	79
3.1.2	The Futures Convexity Bias	84
3.2	Moving On: Bootstrapping the Curve and Creating a Swap Model	86
3.2.1	A Stylized Example	89
3.2.2	PV01s in Our Stylized Example	102
3.3	Moving On: Pricing Up Nonstandard Swaps	102
3.3.1	Mark-to-Markets	104
3.3.2	Unwinds	111
3.3.3	Assignments	112
3.3.4	Forward Starting Swaps	113
4	Caps and Floors	135
4.1	An Introduction to Caps and Floors	135
4.1.1	Cap-Floor Parity	137
4.1.2	Uses of Caps and Floors	138
4.1.3	An Embedded Cap Trade	140
4.1.4	Valuing Caps and Floors	142
4.1.5	Vol	144
4.1.6	Valuing Caps and Floors in Our Stylized Model	147
4.1.7	Variations of Standard Caps and Floors	150
5	Swaptions	166
5.1	An Introduction to Swaptions	166
5.1.1	The Value of Swaptions at Expiration	168
5.1.2	Swaption Parity	169
5.1.3	Uses of Swaptions	170
5.1.4	Valuing Swaptions Using Black's Formula	172
5.1.5	Swaption Vol	174
5.1.6	Pricing Swaptions in Our Stylized Example	175
5.2	The Link Between Caps/Floors and Swaptions	178
5.3	Questioning Black's Model for Interest Rate Options	180
5.3.1	Are Interest Rates Lognormal?	181
5.3.2	Swaption Prices and Implied Vol	184
5.3.3	Skew	184
5.4	The Normal Model	193
5.4.1	Background	193
5.4.2	The Model	194
5.4.3	Pricing Under the Normal Model	195

CONTENTS

5.4.4	Relationship Between Normal Implied Vol and Lognormal Implied Vol for At-the-Money Swaptions	198
5.4.5	Explaining Skew: The Relationship Between Normal Implied Vol and Lognormal Implied Vol for Off-the-Money Swaptions	205
5.4.6	The Normal Model: The Industry Standard	206
5.5	Other Models Used to Price Interest Rate Options	208
5.6	Bermudan Swaptions	209
5.6.1	Optimal Exercise of Bermudan Swaptions	211
5.6.2	Valuation of Bermudan Swaptions	217
6	Swaps with Embedded Options	230
6.1	An Underlying Concept	230
6.2	Cancelable Swaps	232
6.2.1	Some Uses of Cancelable Swaps	234
6.2.2	Solving for the Fixed Rate in Cancelable Swaps	235
6.2.3	Bermudan Cancelables	242
6.3	Index Amortizing Swaps	248
6.3.1	An Explanation of the Trade	250
6.3.2	Pricing Index Amortizing Swaps	252
6.3.3	Relationship Between Index Amortizing Swaps and Cancelable Swaps	253
6.4	Knockout Swaps	256
6.5	Swaps with Convexity Adjustments	262
6.5.1	LIBOR in Arrears Swaps	262
6.5.2	CMS Swaps	273
7	Structured Notes	292
7.1	The Rise of the Structured Note Market	294
7.2	A Glossary of Structured Notes	295
7.3	Size of the Market	299
7.4	What Are Structured Notes?	300
7.5	In the Beginning . . . Floating Rate Notes	305
7.5.1	A Prime Floating Rate Note	305
7.6	Capped Floaters	308
7.6.1	An Example: Pricing Up a Capped Floater	309
7.7	Inverse Floaters	310
7.7.1	An Example: Pricing Up a Leveraged Inverse Floater	315
7.7.2	Orange County	321
7.8	Range Notes	324
7.8.1	LEANs	324
7.8.2	Binary Accrual Notes	326

CONTENTS

7.9	Regulatory Response	331
7.10	Non-Inversion Notes	332
7.10.1	The Pricing of Non-Inversion Notes	333
8	Relative Value and Macro Trades	353
8.1	Carry and Roll-Down Analysis	354
8.2	Curve Trades	361
8.2.1	Yield Curve Trades for Longer Holding Periods	367
8.2.2	Forward Yield Curve Trades	373
8.2.3	Conditional Yield Curve Trades	376
8.3	Trading Swap Spreads	382
8.3.1	Spread Trades for Longer Holding Periods	385
8.3.2	Spread of Spread Trades	387
8.3.3	Conditional Spread Trades	389
8.4	Asset Swaps Revisited	394
8.4.1	Asset Swap Math	398
8.4.2	Asset Swaps Today	400
9	More Recent Product Innovations	414
9.1	An Introduction to Correlation Trades: Caps Versus Payer Redux	415
9.2	Forward Vol Trades	416
9.2.1	Preliminary	417
9.2.2	Description of Forward Vol	419
9.2.3	Heuristic Pricing of Forward Vol Trades	421
9.2.4	Will the Forward Price Be Higher or Lower Than the Spot Price?	424
9.2.5	Are Forward Vol Trades Truly a Pure View on Vol?	425
9.2.6	Bermudan Cancelable Swaps Revisited	426
9.3	Curve Options	427
9.3.1	Why Did Curve Options Come About?	430
9.3.2	Implied Correlation	433
9.3.3	Implied Volatility Versus Realized Volatility	434
9.3.4	Supply and Demand of Curve Options	436
9.3.5	The Pricing of Curve Options	437
9.3.6	A Couple of Trades	442
9.3.7	Delta Hedging Curve Options	450
9.3.8	So Why Did 30-Year Swap Spreads Go Negative — and What Does That Have to Do with Curve Options?	453

Appendixes	463
A Refresher in Option Pricing	463
A.1 The Basics	463
A.2 Boundaries on Option Prices	468
A.3 European Put-Call Parity	474
A.4 Binomial Pricing	475
A.4.1 Multiperiod Extensions	481
A.5 The Black-Scholes Formula	483
A.6 Option Sensitivities	488
A.6.1 Delta	488
A.6.2 Gamma	492
A.6.3 Vega	497
A.6.4 Theta	499
A.7 Binary Options	500
A.7.1 Delta of Binary Options	503
A.7.2 Vega of Binary Options	508
A.8 Packages	510
B A Brief Review of Some Fixed Income Topics	519
B.1 Present Value	519
B.2 Duration	520
B.2.1 Macaulay Duration	520
B.2.2 Modified Duration	521
B.2.3 Effective Duration	522
C A Closer Look at Day Count and Payment Conventions in Swaps	523
D A Quick Look at Mortgages	529
E The Normal Model	537
E.1 The Relationship Between σ_{LN} and σ_N for Swaptions that Are Struck At-the-Money Forward	539
E.2 The Relationship Between σ_{LN} and σ_N for Off-the-Money Swaptions	541
E.3 Option Sensitivities Under the Normal Model	543
Solutions to Selected Problems	545
Bibliography	585
Index	589

