

SYNTHETIC CDOs

Modelling, Valuation and Risk Management

CRAIG MOUNFIELD



CAMBRIDGE
UNIVERSITY PRESS

Contents

<i>Preface</i>	<i>page</i> xi
<i>Acknowledgements</i>	xvi
1 A primer on collateralised debt obligations	1
1.1 Introduction	1
1.2 Securitisation and tranching	2
1.3 Credit derivative products	6
1.4 Chapter review	24
2 Modelling of obligor default	25
2.1 Introduction	25
2.2 Modelling single-name default as a Poisson process	26
2.3 Modelling default correlation – fundamental concepts	31
2.4 Introducing default dependence via copulas	33
2.5 Rating transition methods for modelling obligor default	36
2.6 Chapter review	43
3 Valuation of credit default swaps	45
3.1 Introduction	45
3.2 Overview of vanilla credit default swaps	46
3.3 Valuation of vanilla CDSs	51
3.4 Calibration of the survival curve to market observed data	58
3.5 Risk sensitivities of vanilla CDSs	62
3.6 Chapter review	65
4 Credit indices	66
4.1 Introduction	66
4.2 Description of the credit indices	67
4.3 Index trading mechanics	69
4.4 Valuation of credit indices	72
4.5 Time series analysis of credit indices	73

4.6	Tranched credit index exposures	78
4.7	Chapter review	80
5	Valuation of default baskets	81
5.1	Introduction	81
5.2	Brief overview of default baskets	82
5.3	General valuation principles for default baskets	84
5.4	Analytic valuation of default baskets in simple limiting cases	86
5.5	Monte Carlo valuation of default baskets	89
5.6	Phenomenology of default baskets	93
5.7	Semi-analytic valuation of default baskets	105
5.8	Chapter review	108
6	Valuation of synthetic CDOs	110
6.1	Introduction	110
6.2	Synthetic CDO cashflow mechanics	111
6.3	Basic principles of synthetic CDO pricing	114
6.4	Valuation in the standard market model using Monte Carlo simulation	118
6.5	Valuation in the standard market model using semi-analytic techniques	121
6.6	Structural models	133
6.7	Chapter review	135
7	Phenomenology of the standard market model	137
7.1	Introduction	137
7.2	Baseline case analysed	137
7.3	Tranche loss statistics	138
7.4	Analysis of the portfolio loss distribution	142
7.5	Correlation and maturity sensitivity of the tranche par spread	149
7.6	Default baskets revisited	158
7.7	Chapter review	158
8	Risk quantification of synthetic CDOs	160
8.1	Introduction	160
8.2	Synthetic CDO risk factors	160
8.3	Baseline case analysed	162
8.4	Quantifying credit spread sensitivities – CS01	163
8.5	Quantifying correlation sensitivities – correlation vega	172
8.6	Quantifying default risk sensitivities – value-on-default (VoD)	174
8.7	Tranche time decay	177
8.8	Credit spread value-at-risk (CVaR)	181

8.9	Default value-at-risk (DVaR)	184
8.10	Chapter review	189
9	Implied and base correlations	190
9.1	Introduction	190
9.2	Market quoting conventions	191
9.3	The correlation smile and implied correlation	192
9.4	The market solution – base correlations	197
9.5	Chapter review	203
10	Extensions of the standard market model	204
10.1	Introduction	204
10.2	Extending the standard market model	205
10.3	Dynamic portfolio loss models	221
10.4	Chapter review	222
11	Exotic CDOs	224
11.1	Introduction	224
11.2	Synthetic CDO ² and CDO ⁿ	225
11.3	Cashflow CDOs	229
11.4	Asset backed CDS (ABCDs)	241
11.5	ABX indices and tranching ABX (TABX) exposures	243
11.6	Chapter review	247
12	Correlation trading of synthetic CDO tranches	249
12.1	Introduction	249
12.2	An overview of correlation trading	250
12.3	Delta hedging of synthetic CDO tranches	258
12.4	Analysis of common correlation trading strategies	264
12.5	Credit market dislocations	270
12.6	Chapter review	276
13	Risk management of a portfolio of synthetic CDOs	277
13.1	Introduction	277
13.2	Set-up of the problem	278
13.3	Portfolio risk measures	285
13.4	Description of the sample portfolio	289
13.5	Basic analysis of the sample portfolio	292
13.6	Adding new trades to the portfolio	302
13.7	Origination of synthetic CDOs	305
13.8	Chapter review	308
14	Hedging simulation of structured credit products	309
14.1	Introduction	309
14.2	What is hedging simulation?	310
14.3	Hedging of structured credit products	313

14.4	Hedging simulation of default baskets	316
14.5	Hedging simulation of synthetic CDO tranches	320
14.6	Portfolio exposure measurement	337
14.7	Chapter review	349
	<i>Appendix A: Explanation of common notation</i>	351
	<i>Appendix B: Simulated annealing</i>	352
	<i>References</i>	357
	<i>Index</i>	364