

Contents

1	Introduction	1
2	The option pricing framework	7
2.1	Zero-coupon bond options	8
2.2	Coupon bond options	10
3	The Edgeworth Expansion	15
3.1	The generalized EE scheme	16
3.2	The approximation of a χ^2 -pdf	21
3.3	The approximation of a lognormal-pdf	24
4	The Integrated Edgeworth Expansion	29
4.1	The generalized IEE scheme	30
4.2	An approximation of the χ^2 -cdf	32
4.3	An approximation of the lognormal-cdf	34
5	Multi-Factor HJM models	39
5.1	The change of measure	43
5.2	Pricing of zero-coupon bond options	44
5.2.1	The closed-form solution	45
5.2.2	The closed-form solution performing a FRFT	49
5.3	Pricing of coupon bond options	53
5.3.1	A special closed-form solution	55
5.3.2	The special solution performing an IEE	57
5.3.3	The one-factor solution performing an IEE	62
5.3.4	The multi-factor solution performing an EEE	65
6	Multiple-Random Fields term structure models	71
6.1	Random Fields	71

6.2	Multiple-Random Field HJM-framework	75
6.3	Change of measure	80
6.4	Pricing of zero bond options	81
6.4.1	A closed-form Random Field solution	81
6.5	Pricing of coupon bond options	86
6.5.1	The single-Random Field solution performing an IEE	86
6.5.2	The multiple-Random Field solution running an IEE	89
7	Multi-factor USV term structure model	93
7.1	The change of measure	97
7.2	Pricing of zero-coupon bond options	98
7.2.1	The independent solution performing a FRFT	99
7.2.2	The dependent solution performing a FRFT	102
7.3	Pricing of coupon bond options	106
7.3.1	The one-factor solution performing an IEE	107
7.3.2	The multi-factor solution performing an IEE	110
8	Conclusions	113
9	Appendix	117
9.1	Independent Brownian motions	117
9.2	Dependent Brownian motions	119
9.2.1	Case 1	120
9.2.2	Case 2	121
9.2.3	Case 3	122
10	Matlab codes for the EE and IEE	125
10.1	Integer equation	125
10.2	Computation of the cumulants given the moments	126
10.3	Computation of the Hermite polynomial	127
10.4	The EE	128
10.5	The IEE	129
	References	131
	List of figures	135
	List of tables	137