

Risk Management and Financial Institutions

John Hull

*Maple Financial Chair in Derivatives and Risk Management
Joseph L. Rotman School of Management
University of Toronto*

• HOCHSCHULE
LIECHTENSTEIN
BIHlothek

PEARSON
Prentice
Hall

Pearson Education International

Contents

	Business Snapshots	xiii
	Preface	xv
Chapter 1	Introduction	1
	1.1 Risk vs. return for investors.....	2
	1.2 Risk vs. return for companies.....	12
	1.3 Bank capital.....	15
	1.4 Approaches to managing risk.....	18
	1.5 The management of net interest income.....	20
	Summary.....	22
	Further reading.....	23
	Questions and problems.....	24
	Assignment questions.....	25
Chapter 2	Financial products and how they are used for hedging	27
	2.1 The markets.....	27
	2.2 When to hedge.....	28
	2.3 The "plain vanilla" products.....	30
	2.4 Using the products for hedging.....	43
	2.5 Exotic options and structured deals.....	46
	2.6 Dangers.....	48
	Summary.....	48
	Further reading.....	50
	Questions and problems.....	50
	Assignment questions.....	53
Chapter 3	How traders manage their exposures	55
	3.1 Delta.....	55
	3.2 Gamma.....	63
	3.3 Vega.....	65
	3.4 Theta.....	67
	3.5 Rho.....	69
	3.6 Calculating Greek letters.....	69
	3.7 Taylor series expansions.....	70
	3.8 The realities of hedging.....	72

3.9	Hedging exotics.....	73
3.10	Scenario analysis.....	74
	Summary.....	75
	Further reading.....	76
	Questions and problems.....	76
	Assignment questions.....	78
Chapter 4	Interest rate risk.....	79
4.1	Measuring interest rates.....	80
4.2	Zero rates and forward rates.....	83
4.3	Treasury rates.....	85
4.4	LIBOR and swap rates.....	87
4.5	Duration.....	89
4.6	Convexity.....	93
4.7	Application to portfolios.....	94
4.8	Nonparallel yield curve shifts.....	96
4.9	Interest rate deltas.....	98
4.10	Principal components analysis.....	100
4.11	Gamma and vega.....	104
	Summary.....	105
	Further reading.....	106
	Questions and problems.....	106
	Assignment questions.....	108
Chapters	Volatility.....	111
5.1	Definition of volatility.....	112
5.2	Implied volatilities.....	114
5.3	Estimating volatility from historical data.....	115
5.4	Are daily percentage changes in financial variables normal?.....	117
5.5	Monitoring daily volatility.....	121
5.6	The exponentially weighted moving average model.....	123
5.7	The GARCH(1,1) model.....	125
5.8	Choosing between the models.....	127
5.9	Maximum-likelihood methods.....	127
5.10	Using GARCH(1,1) to forecast future volatility.....	133
	Summary.....	137
	Further reading.....	138
	Questions and problems.....	139
	Assignment questions.....	140
Chapter 6	Correlations and Copulas.....	143
6.1	Definition of correlation.....	144
6.2	Monitoring correlation.....	146
6.3	Multivariate normal distributions.....	149

6.4	Copulas.....	152
6.5	Application to loan portfolios.....	159
	Summary.....	161
	Further reading.....	161
	Questions and problems.....	162
	Assignment questions.....	163
Chapter 7	Bank regulation and Basel II.....	165
7.1	Reasons for regulating bank capital.....	167
7.2	Pre-1988.....	168
7.3	The 1988 BIS Accord.....	169
7.4	The G-30 policy recommendations.....	172
7.5	Netting.....**.....	174
7.6	The 1996 Amendment.....	176
7.7	Basel II.....	178
7.8	Credit risk capital under Basel II.....	179
7.9	Operational risk under Basel II.....	188
7.10	Supervisory review..... $t^{\wedge}>\&t*\&fr^{*}+«*Mtt\&l$	
7.11	Market discipline.....	190
	Summary.....	191
	Further reading.....	192
	Questions and problems.....	192
	Assignment questions.....	194
Chapter 8	The VaR measure.....	195
8.1	Definition of VaR.....	196
8.2	VaR vs. expected shortfall.....	198
8.3	Properties of risk measures.....	199
8.4	Choice of parameters for VaR.....	202
8.5	Marginal VaR, incremental VaR, and component VaR... ..	206
8.6	Back testing.....	208
8.7	Stress testing.....	212
	Summary.....	213
	Further reading.....	214
	Questions and problems.....	215
	Assignment questions.....	216
Chapter 9	Market risk VaR: historical simulation approach.....	217
9.1	The methodology.....	217
9.2	Accuracy.....	220
9.3	Extensions.....	221
9.4	Extreme value theory.....	224
9.5	Application.....	227
	Summary.....	229
	Further reading.....	230

	Questions and problems.....	231
	Assignment questions.....	231
Chapter 10	Market risk VaR: model-building approach.....	233
	10.1 The basic methodology.....	234
	10.2 The linear model.....	237
	10.3 Handling interest rates.....	238
	10.4 Applications of the linear model.....	242
	10.5 The linear model and options.....	242
	10.6 The quadratic model.....	246
	10.7 Monte Carlo simulation.....	248
	10.8 Using distributions that are not normal.....	249
	10.9 Model building*vs. historical simulation.....	250
	Summary.....	251
	Further reading.....	252
	Questions and problems.....	252
	Assignment questions.....	254
Chapter 11	Credit risk: estimating default probabilities.....	255
	11.1 Credit ratings.....	255
	11.2 Historical default probabilities.....	258
	11.3 Recovery rates.....	260
	11.4 Estimating default probabilities from bond prices.....	261
	11.5 Comparison of default probability estimates.....	265
	11.6 Using equity prices to estimate default probabilities.....	269
	Summary.....	272
	Further reading.....	273
	Questions and problems.....	273
	Assignment questions.....	275
Chapter 12	Credit risk losses and credit VaR.....	277
	12.1 Estimating credit losses.....	278
	12.2 Credit risk mitigation.....	283
	12.3 Credit VaR.....	287
	12.4 Vasicek's model.....	287
	12.5 Credit Risk Plus.....	288
	12.6 CreditMetrics.....	289
	12.7 Interpreting credit correlations.....	293
	Summary.....	295
	Further reading.....	295
	Questions and problems.....	296
	Assignment questions.....	297
Chapter 13	Credit derivatives.....	299
	13.1 Credit default swaps.....	299
	13.2 Credit indices.....	303

13.3	Valuation of credit default swaps.....	303
13.4	CDS forwards and options.....	308
13.5	Total return swaps.....	310
13.6	Basket credit default swaps.....	311
13.7	Collateralized debt obligations.....	311
13.8	Valuation of a basket CDS and CDO.....	314
	Summary.....	316
	Further reading.....	317
	Questions and problems.....	317
	Assignment questions.....	319
Chapter 14	Operational risk.....	321
14.1	What is operational risk?.....	323
14.2	Determination of regulatory capital.....	324
14.3	Categorization of operational risks.....	326
14.4	Loss severity and loss frequency.....	327
14.5	Forward looking approaches.....	331
14.6	Allocation of operational risk capital.....	333
14.7	Use of the power law.....	335
14.8	Insurance.....	335
14.9	Sarbanes-Oxley.....	337
	Summary.....	338
	Further reading.....	339
	Questions and problems.....	340
	Assignment questions.....	340
Chapter 15	Model risk and liquidity risk.....	343
15.1	The nature of models in finance.....	344
15.2	Models for nonlinear products.....	345
15.3	Models for actively traded products.....	346
15.4	Models for structured products.....	351
15.5	Dangers in model building.....	352
15.6	Detecting model problems.....	353
15.7	Traditional view of liquidity risk.....	354
15.8	Liquidity black holes.....	356
15.9	Long-term capital management.....	360
15.10	Liquidity vs. profitability.....	361
	Summary.....	362
	Further reading.....	363
	Questions and problems.....	363
	Assignment questions.....	364
Chapter 16	Economic capital and RAROC.....	365
16.1	Definition of economic capital.....	366
16.2	Components of economic capital.....	368

16.3	Shapes of the loss distributions.....	370
16.4	Relative importance of risks.....	372
16.5	Aggregating economic capital.....	373
16.6	Allocation of the diversification benefit.....	377
16.7	Deutsche Bank's economic capital.....	378
16.8	RAROC.....	379
	Summary.....	381
	Further reading.....	381
	Questions and problems.....	381
	Assignment questions.....	382
Chapter 17	Weather, energy, and insurance derivatives.....	385
17.1	Weather derivatives.....	385
17.2	Energy derivatives.....	387
17.3	Insurance derivatives.....	390
	Summary.....	391
	Further reading.....	392
	Questions and problems.....	393
	Assignment question.....	394
Chapter 18	Big losses and what we can learn from them.....	395
18.1	Risk limits.....	397
18.2	Managing the trading room.....	399
18.3	Liquidity risk.....	402
18.4	Lessons for nonfinancial corporations.....	404
	Summary.....	406
	Further reading.....	406
Appendix A:	Valuing forward and futures contracts.....	407
Appendix B:	Valuing swaps.....	409
Appendix C:	Valuing European options.....	413
Appendix D:	Valuing American options.....	417
Appendix E:	The manipulation of credit transition matrices.....	421
	Answers to questions and problems.....	423
	Glossary of terms.....	457
	DerivaGem software.....	479
	Table for $N(x)$ when $x < 0$	484
	Table for $N(x)$ when $x \geq 0$	485
	Index.....	487