



RISK
MANAGEMENT
AND
FINANCIAL
INSTITUTIONS

SECOND EDITION

JOHN C. HULL

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RISK MANAGEMENT AND FINANCIAL INSTITUTIONS

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*To
Michelle, Peter, and David*

SECOND EDITION

**RISK MANAGEMENT
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FINANCIAL INSTITUTIONS**

Preface

Much has happened in financial markets since the first edition of this book was published in 2006. Huge losses have been experienced by financial institutions throughout the world. Both financial institutions and their regulators have been re-evaluating risk management practices. Stress testing and liquidity risk are receiving more attention.

Risk Management and Financial Institutions has been expanded and updated to reflect these market developments. Like my popular text *Options, Futures, and Other Derivatives*, the book is designed to be useful to practicing managers as well as college students. Those studying for GARP and PRMIA qualifications will find the book particularly helpful.

The book is appropriate for elective courses in either risk management or financial institutions. It is not necessary for students to take a course on options and futures markets prior to taking a course based on this book. But if they have taken such a course, some of the material in the first seven chapters does not need to be covered.

The level of mathematical sophistication and the way material is presented has been managed carefully so that the book is accessible to as wide an audience as possible. For example, when covering copulas in Chapter 10, the intuition is presented first and then followed by a detailed numerical example; when covering maximum likelihood methods in Chapter 9 and extreme value theory in Chapter 12, numerical examples and sufficient details are provided for readers to develop their own Excel[®] spreadsheets. I have provided my own Excel spreadsheets for applications, where appropriate; these are available on my website.

This is a book about risk management, so there is relatively little material on the valuation of derivatives contracts. (This is the main focus of my other two books *Options, Futures, and Other Derivatives* and *Fundamentals of Futures and Options Markets*.) The appendices at the end of the book include material that summarizes some of the key results that are important to risk managers.

What's New in This Edition?

The second edition contains much new material. In particular:

1. There are three new chapters providing background material on financial institutions. These are Chapter 2 on banks, Chapter 3 on insurance companies and pension plans, and Chapter 4 on mutual funds and hedge funds.
2. There is a new chapter titled "ABSs, CDOs, and the Credit Crunch of 2007" (Chapter 16). This explains the events that led to the credit crisis of 2007–2009 and the lessons that can be learned from it.

3. There is a new chapter titled “Scenario Analysis and Stress Testing” (Chapter 17). This reflects the importance now placed on stress testing by both financial institutions and their regulators.
4. There are separate chapters on liquidity risk and model risk (Chapters 19 and 20). Both of these topics have assumed greater importance since 2007.
5. Value at risk is now introduced before Basel II is discussed (Chapter 8). This sequence was suggested to me as more logical by a number of instructors.
6. A sample portfolio with accompanying spreadsheets (available on the author’s website) is used for explaining alternative approaches for calculating value at risk.
7. There are many more numerical examples.
8. The DerivaGem software (version 1.53) is included with the book.

DerivaGem Software

Version 1.53 of the widely acclaimed software DerivaGem is included with this book. An installation routine is provided with this version of the software. This loads files into correct folders, creates icons, and makes it easier for students to start using the software. DerivaGem consists of two Excel applications: the *Options Calculator* and the *Applications Builder*. The Options Calculator consists of easy-to-use software for valuing a wide range of options. The Applications Builder consists of a number of Excel functions from which users can build their own applications. It includes a number of sample applications that enable students to explore risk management issues. It also allows more interesting assignments to be designed. The software is described more fully at the end of the book. Updates to the software can be downloaded from the author’s website:

www.rotman.utoronto.ca/~hull

PowerPoint Slides

Several hundred PowerPoint slides (ISBN 0-13-610332-4) can be downloaded from Pearson’s Instructor Resource Center (www.pearsonhighered.com/irc) or from my own website. Adopting instructors are welcome to adapt the slides to meet their own needs.

Questions and Problems

End-of-chapter problems are divided into two groups: “Practice Questions and Problems” and “Further Questions.” The solutions to the former are at the end of the book. Solutions to the latter are made available by the publisher to adopting instructors in the Instructor’s Manual.

Instructor’s Manual

The Instructor’s Manual (ISBN 0-13-610329-4) is made available online to adopting instructors by Pearson. It contains solutions to the “Further Questions,” notes on the teaching of each chapter, and some advice on course organization.

Acknowledgments

Many people have played a part in the production of this book. I have benefited from interactions with many academics and practicing risk managers. I would like to thank

the students in my MBA and MFin courses at the University of Toronto, many of whom have made suggestions as to how the material could be improved. Eddie Mizzi from the Geometric Press did an excellent job editing the final manuscript and handling the page composition. Derrick Knie and Milena Litoiu provided excellent research assistance.

Alan White, a colleague at the University of Toronto, deserves a special acknowledgment. Alan and I have been carrying out joint research and consulting in the area of derivatives and risk management for over 25 years. During that time we have spent countless hours discussing key issues. Many of the new ideas in this book, and many of the new ways used to explain old ideas, are as much Alan's as mine. Alan has done most of the development work on the DerivaGem software.

Special thanks are due to many people at Pearson, particularly my editor Donna Battista, for their enthusiasm, advice, and encouragement.

I welcome comments on the book from readers. My e-mail address is:

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CONTENTS IN BRIEF

Business Snapshots	xiii
Preface	xv
1. Introduction	1
2. Banks	19
3. Insurance Companies and Pension Plans	39
4. Mutual Funds and Hedge Funds	63
5. Financial Instruments	83
6. How Traders Manage Their Exposures	113
7. Interest Rate Risk	135
8. Value at Risk	157
9. Volatility	175
10. Correlation and Copulas	203
11. Regulation, Basel II, and Solvency II	221
12. Market Risk VaR: Historical Simulation Approach	249
13. Market Risk VaR: Model-Building Approach	267
14. Credit Risk: Estimating Default Probabilities	289
15. Credit Risk Losses and Credit VaR	313
16. ABSs, CDOs, and the Credit Crunch of 2007	333
17. Scenario Analysis and Stress Testing	353
18. Operational Risk	367
19. Liquidity Risk	385
20. Model Risk	407
21. Economic Capital and RAROC	425
22. Risk Management Mistakes to Avoid	441
Appendices	451
Answers to Practice Questions and Problems	479
Glossary of Terms	511
DerivaGem Software	533
Tables for Cumulative Normal Distribution	539
Index	543

Contents

Business Snapshots	<i>xiii</i>
Preface	<i>xv</i>
Chapter 1. Introduction	1
1.1 Risk vs. return for investors	2
1.2 The efficient frontier	5
1.3 The capital asset pricing model	7
1.4 Arbitrage pricing theory	12
1.5 Risk vs return for companies	12
1.6 Risk management by financial institutions	14
Summary	16
Further reading	17
Practice questions and problems	17
Further questions	18
Chapter 2. Banks	19
2.1 Commercial banking	20
2.2 The capital requirements of a small commercial bank	22
2.3 Deposit insurance	24
2.4 Investment banking	25
2.5 Securities trading	29
2.6 Potential conflicts of interest in banking	30
2.7 Today's large banks	31
2.8 The risks facing banks	34
Summary	35
Further reading	36
Practice questions and problems	36
Further questions	37
Chapter 3. Insurance Companies and Pension Plans	39
3.1 Life insurance	39
3.2 Annuity contracts	43
3.3 Mortality tables	45
3.4 Longevity and mortality risk	47
3.5 Property-casualty insurance	48
3.6 Health insurance	50
3.7 Moral hazard and adverse selection	52
3.8 Reinsurance	53
3.9 Capital requirements	53
3.10 The risks facing insurance companies	54
3.11 Regulation	55
3.12 Pension plans	56
Summary	59

	Further reading.....	60
	Practice questions and problems	60
	Further questions	61
Chapter 4.	Mutual Funds and Hedge Funds	63
4.1	Mutual funds	63
4.2	Hedge funds.....	70
4.3	Hedge fund strategies.....	74
4.4	Hedge fund returns	78
	Summary	80
	Further reading.....	80
	Practice questions and problems	81
	Further questions	81
Chapter 5.	Financial Instruments.....	83
5.1	The markets	83
5.2	Long and short positions in assets.....	84
5.3	Derivatives markets	86
5.4	Plain vanilla derivatives.....	87
5.5	Margins.....	97
5.6	Nontraditional derivatives	101
5.7	Exotic options and structured products	104
5.8	Risk management challenges.....	105
	Summary	106
	Further reading.....	107
	Practice questions and problems	108
	Further questions	110
Chapter 6.	How Traders Manage Their Exposures	113
6.1	Delta.....	113
6.2	Gamma	120
6.3	Vega	122
6.4	Theta	124
6.5	Rho	124
6.6	Calculating Greek letters	125
6.7	Taylor series expansions	126
6.8	The realities of hedging	128
6.9	Hedging exotic options	129
6.10	Scenario analysis.....	130
	Summary	131
	Further reading.....	131
	Practice questions and problems	131
	Further questions	133
Chapter 7.	Interest Rate Risk	135
7.1	The management of net interest income.....	135
7.2	LIBOR and swap rates	138
7.3	Duration.....	139
7.4	Convexity.....	142
7.5	Generalization	144
7.6	Nonparallel yield curve shifts.....	146
7.7	Interest rate deltas in practice.....	148
7.8	Principal components analysis.....	150
7.9	Gamma and vega.....	153
	Summary	154

	Further reading	154
	Practice questions and problems.....	155
	Further questions.....	155
Chapter 8. Value at Risk.....		157
8.1	Definition of VaR.....	157
8.2	Examples of the calculation of VaR.....	158
8.3	VaR vs expected shortfall.....	160
8.4	VaR and capital	162
8.5	Coherent risk measures	163
8.6	Choice of parameters for VaR	165
8.7	Marginal VaR, incremental VaR, and component VaR	168
8.8	Back-testing	169
	Summary.....	172
	Further reading	172
	Practice questions and problems.....	173
	Further questions.....	174
Chapter 9. Volatility.....		175
9.1	Definition of volatility	175
9.2	Implied volatilities.....	177
9.3	Estimating volatility from historical data	179
9.4	Are daily percentage changes in financial variables normal?	180
9.5	Monitoring daily volatility	184
9.6	The exponentially weighted moving average model.....	186
9.7	The GARCH(1,1) model.....	188
9.8	Choosing between the models.....	189
9.9	Maximum-likelihood methods.....	190
9.10	Using GARCH(1,1) to forecast future volatility.....	194
	Summary.....	197
	Further reading	198
	Practice questions and problems.....	199
	Further questions.....	200
Chapter 10. Correlations and Copulas		203
10.1	Definition of correlation	203
10.2	Monitoring correlation	205
10.3	Multivariate normal distributions	208
10.4	Copulas.....	210
10.5	Application to loan portfolios.....	216
	Summary.....	218
	Further reading	218
	Practice questions and problems.....	219
	Further questions.....	220
Chapter 11. Regulation, Basel II, and Solvency II		221
11.1	Reasons for regulating banks.....	221
11.2	Bank regulation pre-1988	222
11.3	The 1988 Basel accord.....	223
11.4	The G-30 policy recommendations	226
11.5	Netting.....	227
11.6	The 1996 amendment	229
11.7	Basel II	231
11.8	Credit risk capital under Basel II	232
11.9	Operational risk capital under Basel II.....	240

11.10	Pillar 2: supervisory review	240
11.11	Pillar 3: market discipline	241
11.12	Revisions to Basel II.....	241
11.13	Solvency II.....	243
	Summary	244
	Further reading.....	245
	Practice questions and problems	245
	Further questions	247
Chapter 12.	Market Risk VaR: Historical Simulation Approach	249
12.1	The methodology	249
12.2	Accuracy.....	254
12.3	Extensions	255
12.4	Extreme value theory	259
12.5	Applications	261
	Summary	263
	Further reading.....	264
	Practice questions and problems	264
	Further questions	265
Chapter 13.	Market Risk VaR: Model-Building Approach.....	267
13.1	The basic methodology	267
13.2	Generalization	269
13.3	Correlation and covariance matrices.....	270
13.4	Handling interest rates	274
13.5	Applications of the linear model.....	277
13.6	Linear model and options	277
13.7	Quadratic model	280
13.8	Monte Carlo simulation	282
13.9	Nonnormal distributions	283
13.10	Model building vs historical simulation	284
	Summary	285
	Further reading.....	285
	Practice questions and problems	285
	Further questions	287
Chapter 14.	Credit Risk: Estimating Default Probabilities	289
14.1	Credit ratings.....	289
14.2	Historical default probabilities	291
14.3	Recovery rates	293
14.4	Credit default swaps	294
14.5	Credit spreads.....	298
14.6	Estimating default probabilities from credit spreads.....	301
14.7	Comparison of default probability estimates.....	303
14.8	Using equity prices to estimate default probabilities	307
	Summary	309
	Further reading.....	310
	Practice questions and problems	310
	Further questions	312
Chapter 15.	Credit Risk Losses and Credit VaR.....	313
15.1	Estimating credit losses	313
15.2	Credit risk mitigation.....	319
15.3	Credit VaR	321
15.4	Vasicek's model and Merton's model	323

15.5	Credit Risk Plus	324
15.6	CreditMetrics	325
	Summary	329
	Further reading	329
	Practice questions and problems	330
	Further questions	331
Chapter 16.	ABSs, CDOs, and the Credit Crunch of 2007	333
16.1	The US housing market	333
16.2	Securitization	336
16.3	Valuation mistakes	341
16.4	Avoiding future crises	342
16.5	Synthetic CDOs	346
	Summary	348
	Further reading	349
	Practice questions and problems	350
	Further questions	350
Chapter 17.	Scenario Analysis and Stress Testing	353
17.1	Generating the scenarios	353
17.2	Regulation	358
17.3	What to do with the results	361
	Summary	364
	Further reading	364
	Practice questions and problems	365
	Further questions	365
Chapter 18.	Operational Risk	367
18.1	What is operational risk?	368
18.2	Determination of regulatory capital	369
18.3	Categorization of operational risks	371
18.4	Loss severity and loss frequency	371
18.5	Proactive approaches	375
18.6	Allocation of operational risk capital	377
18.7	Use of the power law	378
18.8	Insurance	378
18.9	Sarbanes–Oxley	379
	Summary	380
	Further reading	381
	Practice questions and problems	381
	Further questions	382
Chapter 19.	Liquidity Risk	385
19.1	Liquidity trading risk	385
19.2	Liquidity funding risk	391
19.3	Liquidity black holes	398
	Summary	403
	Further reading	404
	Practice questions and problems	405
	Further questions	405
Chapter 20.	Model Risk	407
20.1	Marking to market	407
20.2	Models for linear products	409
20.3	Physics vs. finance	410
20.4	How models are used for pricing standard products	411

20.5	Hedging.....	418
20.6	Models for nonstandard products.....	418
20.7	Dangers in model building	419
20.8	Detecting model problems	420
	Summary	421
	Further reading.....	421
	Practice questions and problems	422
	Further questions	422
Chapter 21.	Economic Capital and RAROC	425
21.1	Definition of economic capital	425
21.2	Components of economic capital	427
21.3	Shapes of the loss distributions	429
21.4	Relative importance of risks.....	430
21.5	Aggregating economic capital.....	432
21.6	Allocation of economic capital.....	435
21.7	Deutsche bank's economic capital	436
21.8	RAROC	436
	Summary	438
	Further reading.....	439
	Practice questions and problems	439
	Further questions	440
Chapter 22.	Risk Management Mistakes to Avoid.....	441
22.1	Risk limits	441
22.2	Managing the trading room.....	444
22.3	Liquidity risk	446
22.4	Lessons for nonfinancial corporations	448
	Summary	450
	Further reading.....	450
Appendix A:	Compounding Frequencies and Interest Rates	451
Appendix B:	Zero Rates, Forward Rates, and Zero-Coupon Yield Curves	455
Appendix C:	Valuing Forward and Futures Contracts	459
Appendix D:	Valuing Swaps.....	461
Appendix E:	Valuing European Options.....	463
Appendix F:	Valuing American Options.....	465
Appendix G:	Taylor Series Expansions	469
Appendix H:	Eigenvectors and Eigenvalues	473
Appendix I:	Principal Components Analysis.....	475
Appendix J:	Manipulation of Credit Transition Matrices.....	477
	Answers to Practice Questions and Problems	479
	Glossary of Terms	511
	DerivaGem Software.....	533
	Tables for Cumulative Normal Distribution	539
	Index	543

BUSINESS SNAPSHOTS

1.1	The Hidden Costs of Bankruptcy	14
2.1	Google [™] 's IPO	28
2.2	Peoplesoft's Poison Pill	29
2.3	How to Keep Loans Performing	33
3.1	Equitable Life	44
3.2	A Perfect Storm	58
4.1	Mutual Fund Returns Can Be Misleading	69
5.1	The Unanticipated Delivery of a Futures Contract	90
5.2	A System's Error	91
5.3	Microsoft [®] 's Hedging	105
5.4	Procter and Gamble's Bizarre Deal	106
5.5	The Barings Bank Disaster	107
6.1	Hedging by Gold Mining Companies	116
6.2	Dynamic Hedging in Practice	128
6.3	Is Delta Hedging Easier or More Difficult for Exotics	130
7.1	Expensive Failures of Financial Institutions in the US	137
8.1	Historical Perspectives on VaR	158
9.1	What Causes Volatility?	177
9.2	Making Money from Foreign Currency Options	182
11.1	Systemic Risk	222
11.2	Basel III?	242
14.1	The CDS Market	295
14.2	Is the CDS Market a Fair Game?	296
14.3	Risk-Neutral Valuation	305
15.1	Long-Term Capital Management's Big Loss	321
15.2	Downgrade Triggers and Enron's Bankruptcy	322
16.1	Not All BBBs Are the Same	342
17.1	Traffic Light Options	361
18.1	The Hammersmith and Fulham Story	376
18.2	Rogue Trader Insurance	380
19.1	Northern Rock	392
19.2	Ashanti Goldfields	395
19.3	Metallgesellschaft	396
19.4	The Crash of 1987	400
20.1	Kidder Peabody's Embarrassing Mistake	410
20.2	Exploiting the Weaknesses of a Competitor's Model	411
20.3	Crashophobia	415
21.1	The EGT Fund	432
22.1	Big Losses	442



1

CHAPTER

Introduction

Imagine you are the chief risk officer of a major corporation. The CEO wants your views on a major new venture. You have been inundated with reports showing that the new venture has a positive net present value and will enhance shareholder value. What sort of analysis and ideas is the CEO looking for from you?

As chief risk officer it is your job to consider how the new venture fits into the company's portfolio. What is the correlation of the performance of the new venture with the rest of the company's business? When the rest of the business is experiencing difficulties, will the new venture also provide poor returns, or will it have the effect of dampening the ups and downs in the rest of the business?

Companies must take risks if they are to survive and prosper. The risk management function's primary responsibility is to understand the portfolio of risks that the company is currently taking and the risks it plans to take in the future. It must decide whether the risks are acceptable and, if they are not acceptable, what action should be taken.

Most of this book is concerned with the ways risks are managed by banks and other financial institutions, but many of the ideas and approaches we will discuss are equally applicable to nonfinancial corporations. Risk management has become a progressively more important for all corporations in the last few decades. Financial institutions in particular are finding they have to increase the resources they devote to risk management. Large "rogue trader" losses such as those at Barings Bank in 1995, Allied Irish Bank in 2002, and Société Générale in 2007 would have been avoided if procedures used by the banks for collecting data on trading positions had more been more carefully developed. Huge "subprime" losses at banks such as Citigroup, UBS, and Merrill Lynch would have been less severe if risk management groups had been able to convince senior management that unacceptable risks were being taken.

This opening chapter sets the scene. It starts by reviewing the classical arguments concerning the risk–return trade-offs faced by an investor who is choosing a portfolio of stocks and bonds. It then considers whether the same arguments can be used by a company in choosing new projects and managing its risk exposure. The chapter concludes that there are reasons why companies—particularly financial institutions—should be concerned with the total risk they face, not just with the risk from the viewpoint of a well-diversified shareholder.