RISK MANAGEMENT AND FINANCIAL INSTITUTIONS

SECOND EDITION

JOHN C. HULL

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To
Michelle, Peter, and David

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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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BUSINESS SNAPSHOTS

CHAPTER 1

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.