



STRATEGIC

MANAGEMENT

ISSUES

**DERIVATIVES
FOR DECISION MAKERS**

George Crawford • Bidyut Sen

FINANCIAL
ENGINEERING

Derivatives *for* Decision Makers

Strategic Management Issues

George Crawford and Bidyut Sen



JOHN WILEY & SONS, INC.

New York • Chichester • Brisbane • Toronto • Singapore

This text is printed on acid-free paper.

Copyright © 1996 by George Crawford and Bidyut Sen
Published by John Wiley & Sons, Inc.

All rights reserved. Published simultaneously in Canada.

Reproduction or translation of any part of this work beyond that permitted by Section 107 or 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permissions Department, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher and authors are not engaged in rendering legal, accounting, or other professional services. If legal advice or other expert assistance is required, the services of a competent professional person should be sought.

The views, thoughts, and opinions expressed in this book are those of the authors in their individual capacities and should not in any way be attributed to Morgan Stanley, any of its affiliates, or Mr. Bidyut Sen as a representative, Managing Director, or employee of Morgan Stanley. In addition, chapters 10 through 15 represent the sole work product of the Stanford team and should not in any way be attributed to Morgan Stanley, any of its affiliates, or Mr. Bidyut Sen in his individual capacity or as a representative, Managing Director, or employee of Morgan Stanley.

Library of Congress Cataloging-in-Publication Data:

Crawford, George

Derivatives : strategic management issues / George Crawford
and Bidyut Sen.

p. cm.

Includes index.

ISBN 0-471-12994-1 (cloth : alk. paper)

1. Derivative securities—United States. I. Sen, Bidyut.

II. Title.

HG6024.U6C7 1996

332.84'5—dc20

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

Financial Dedication to Fiduciary Foundation

All of the authors' financial proceeds from writing this book have been dedicated to the Fiduciary Foundation, a charitable foundation with a mission to educate and assist the fiduciaries who control much of the wealth of the world through pension, corporate, mutual fund, charitable, and private trusts. The authors hope that this book itself, and the activities of the Foundation, will permit fiduciaries to better fulfill their duties, for the greater good of their beneficiaries and of all people.

Personal Dedication

The authors dedicate this book to their families, with love and appreciation.

Foreword

Directors or decision makers need to know about derivatives. A world of information on the subject has been distilled into this comprehensive and understandable book, which offers food for thought to novices and experts alike. I would expect nothing less of the authors, in view of their own wealth of practical experience and theoretical insight.

Those seeking a clear explanation of the basics of derivatives, and of their application to simple and complex situations, will find this book invaluable. It provides new insights and understanding to executives, investors, portfolio managers, traders, and those who have merely heard about the subject and want to have some broad understanding of the implications of the widespread use of derivatives in their pension funds and mutual funds. I am sure that regulators and legislators also will benefit by reading this book.

While I was chairman of the Securities and Investments Board in the United Kingdom, I came to realize that derivatives can be dangerously misunderstood by both users and regulators, but that, properly understood, they provide a set of tools that can be used both safely and effectively. Wise legislative and regulatory approaches must be based on a clear understanding of the issues by regulators and legislators themselves. I hope they will include this book in their reading.

Members of boards of financial institutions and other businesses that are now using derivatives need to understand the subject themselves, at least well enough to ensure that appropriate policies are adopted and rigorously implemented. They cannot afford to turn these responsibilities wholly over to others, as many chief executives and directors have learned to their chagrin.

Despite the great seriousness and importance of its purpose, this book is also very enjoyable. There are anecdotes that entertain as well as instruct, graphs that clearly illustrate key points and complex transactions, very practical tips on avoiding embarrassing losses and legal liabilities, and even some provocative conjecture about what the future may hold. I commend this book most warmly.

SIR DAVID WALKER

Preface

People who manage other people's money, or who through a chain of command have any authority over such managers, need to have some understanding of derivatives since most businesses and investment managers are using them today. If you are a corporate manager or director, pension fiduciary, bank trustee, or in any other capacity responsible for managing money, we wrote this book for you. Even if the only money you manage is that on which you and your family depend, or if you have given other people the authority to manage your money, this book contains important knowledge. So many businesses and investment managers are using derivatives today that no one with any responsibility for money should be functioning without a basic understanding of derivatives. That knowledge is absolutely essential for safety in today's financial environment.

No knowledge of derivatives is assumed at the outset of this book: The basic derivatives (options, futures, swaps, and financially engineered products) are explained, along with the markets in which they are used, and the uses to which they can be put.

This book will show you how derivatives can be used to limit business risks, or to insure your investments against loss, all at a price and with a deductible, just like an insurance policy. The book will also show you how derivatives can be used to seek high profits, at high risk. When you have responsibility for other people's money, either directly or through a chain of command, you need to

know the level of risk you are willing to undertake so that if those risks result in losses—as they sometimes inevitably will—the size of those losses will not come as a complete and unwelcome surprise.

We will also discuss the different kinds of business risks and how they can be hedged with derivatives. Many examples demonstrate ways to hedge business or investment risks, and ways to use derivatives for business and investment, with greater or lesser levels of risk.

This book will also explain lessons to be learned from recent disasters reported in the press concerning derivatives, so that you and those working under you or managing your money don't repeat those mistakes. It will describe how derivative disasters tend to engulf everyone up the chain of command to the very top, so that they can ruin the careers even of those very remote from the particular decisions which backfired. Policies, supervision, and controls to prevent such disasters will also be described.

Finally, we take a look into the future. The use of derivatives has grown spectacularly in recent years, to a point where it is a dominant presence in the world financial system—and these uses are still evolving. A great deal remains unsettled concerning derivatives, and the future is always a mystery, but it is sure to include fascinating developments in this field.

Acknowledgments

The authors appreciate the assistance of colleagues and friends at Morgan Stanley and Stanford Law School, which made this book possible. The very capable work of Matthew Behrent was of great help in all aspects of the book. Members of the Derivatives Products Group at Morgan Stanley, students in the Fiduciary Investing class at Stanford Law School, faculty including Professor Joe Grundfest, the former SEC Commissioner, and Hoover Institution scholars all provided a stimulating sounding board for the ideas underlying the book. Skillful assistance on particular research topics, transaction examples, figures, and the glossary was provided by many, to whom we are most grateful. Special thanks to our assistants who were so generous with their personal time in helping us with the manuscript. The authors also appreciate the many suggestions of colleagues as to the contents and coverage of the book, including those of Bob McCabe, who, as a director of four New York Stock Exchange companies, first pointed out his need for a book such as this.

The authors gratefully acknowledge the invaluable help they have received, but accept the ultimate responsibility for any errors, and indeed reserve the right to modify their own views as this rapidly changing field unfolds.

Contents

<i>Foreword</i>	xiii
<i>Preface</i>	xv
<i>Acknowledgments</i>	xvii
Introduction	1
<i>Fiduciaries and Derivatives</i>	2
<i>Four Uses of Derivatives</i>	3
PART 1 INTRODUCING DERIVATIVES	5
1. Options and Futures	7
<i>Thales of Miletus: Options and Futures</i>	7
<i>How Futures Markets Work</i>	10
<i>Leverage and Risk Control on Futures Exchanges</i>	12
<i>Types of Futures Contracts</i>	13
<i>Futures versus Forwards</i>	13
<i>How Options Work</i>	16
<i>The Options Market</i>	20
2. Swaps and Structured Notes	23
<i>Foreign Currency Swaps and Interest Rate Swaps</i>	23
<i>Swaptions, Caps, and Floors</i>	31
<i>Structured Notes</i>	32
<i>Summary</i>	36

3. Mortgage "Derivatives"	39
<i>Collateralized Mortgage Obligations</i>	39
<i>Summary of CMOs</i>	45
4. Leverage	49
<i>Introduction</i>	49
<i>Leveraging Your House Purchase</i>	50
<i>Hillary Clinton's Leverage</i>	53
 PART 2 DERIVATIVES IN ACTION	 57
5. Overview of Modern Derivatives Uses	59
<i>Uses of Derivatives</i>	59
<i>Derivatives as an Unleveraged Investment: A Proxy for the Underlying Asset</i>	59
<i>Derivatives for Leveraged Investing</i>	60
<i>Hedging, Speculating, and Mixed Applications</i>	63
<i>Financial Engineering</i>	66
6. Hedging a Stock Portfolio	69
<i>Hedging with Futures</i>	70
<i>Hedging with Puts</i>	74
<i>Costs of Hedging: The Time Premium and the Deductible</i>	75
<i>Exercising the Option</i>	77
<i>Eliminating the Deductible: In-the-Money Options</i>	78
<i>Option Pricing: Theoretical Models</i>	80
<i>Hedging a Stock with Synthetic Futures: Buying a Put, Selling a Call</i>	81
<i>Hedging Industry Risk with Synthetic Futures</i>	85
<i>Hedging with Options: Costs and Expectations</i>	87
<i>Dynamic Hedging</i>	89
<i>Program Trading</i>	91
<i>Swaps and Privately Written Options as Alternatives</i>	91
7. Business Risk Management	93
<i>Business Risks</i>	93
<i>Primary Risks</i>	93
<i>Secondary Risks</i>	95
<i>Which Business Risks Should Be Hedged?</i>	97

<i>Can Business Risks Be Hedged with Derivatives?</i>	99
A Short-Term Hedge for Long-Term Financing	100
Exploiting Comparative Advantages: Asset Liability	
Currency Mismatch	102
Price Risk of Restricted Stock Holding	104
Asset-based Financing	105
Conclusion	107
8. Investing Through Derivatives	109
<i>Using Derivatives to Invest in Interest Rates</i>	110
<i>Synthetic Bonds in Foreign Currencies: Credit Rating</i>	
Arbitrage	112
<i>Creating a Diversified Portfolio Using Equity Swaps</i>	112
<i>Investing in Fixed Income Emerging Markets</i>	114
<i>Using Derivatives to Push the Limits of Fiduciary Restraints</i>	116
Conclusion	118

PART 3 UNDERSTANDING AND MANAGING RISK 121

9. Summary of Risk	123
<i>Extent of Use</i>	124
<i>Measuring Risk</i>	125
Market Risk	126
Credit Risk	127
Legal Risk	129
Operational Risk and the Lack of Transparency	130
Systemic Risk	130
<i>Summary of Risk</i>	132
10. Derivative Disasters	135
<i>Leverage: Why Were the Orange County Losses a Surprise?</i>	135
<i>Baring's PLC: The Trader's Option</i>	137
<i>A Failed Hedge: Metallgesellschaft</i>	140
<i>Bankers Trust</i>	142
Conclusion	144
11. Derivative Regulation	147
<i>Options and Futures</i>	148
<i>Over-the-Counter (OTC) Derivatives</i>	148

<i>Quasi Regulation: Trade Groups, Accounting Standards, and Rating Agencies</i>	149
<i>International Regulation</i>	151
12. Controlling Risk	153
<i>Regulatory Safeguards</i>	153
<i>Disclosure</i>	154
<i>Internal Controls</i>	155
The Derivatives Policy	155
Auditing Portfolio Contents	156
Marking to Market	157
Estimating the Risk of Loss	157
Exit Plans	159
Worst Cases: Buying Insurance	160
<i>Unauthorized Trading</i>	160
Examples	161
Detection of Unauthorized Trading	163

PART 4 FIDUCIARY RESPONSIBILITIES OF USING DERIVATIVES

165

13. Your Fiduciary Duty	167
<i>The Duty of Loyalty and Exceptions</i>	167
<i>Duty of Care</i>	169
Business-Judgment Rule	169
Is There a Duty to Hedge?	170
<i>Brane v. Roth</i> : Duty to Hedge	171
The Prudent-Investor Rule	172
Role of Delegation	173
Role of Diversification: Portfolio Theory	174
Duty to Use Derivatives	176
14. Standard of Care in Delegation	177
<i>Introduction</i>	177
<i>General Selection of Experts</i>	177
<i>Instruction of the Expert</i>	179

<i>Selection of Derivative Experts</i>	180
<i>Special Considerations of Derivatives Used as a Hedge</i>	181
<i>Monitoring the Expert Manager</i>	183
15. Legal Liability in Using Derivatives	185
<i>Buyer's Authority to Buy</i>	185
Authority of Trader	185
Buyer's Authority to Buy	186
Ultra Vires	187
<i>Suitability of Derivative Investments</i>	188
Fraud	189
Omissions	189
<i>Fiduciary Duties and Suitability</i>	190
SEC Requirements	190
Product Liability Law Analogy	191
<i>Conclusion</i>	193
16. Looking Forward	195
<i>Glossary</i>	205
<i>Index</i>	213

Introduction

Derivatives can be used as risk management tools or as investment alternatives. They can be used with or without leverage and with or without exposure beyond the amount of the investment. Investing in derivatives can be just as safe as any other form of investing. In fact, it can be much safer. Or it can be very risky, but provide the opportunity for much higher returns. It all depends on the investor's choice.

You are probably using derivatives right now, even if you are unaware of it. We said this to the head of one of the United States' largest pension funds, and he immediately denied it. Then we asked if his pension fund had any investments in foreign stocks. He replied that it did. We asked if the pension fund ever hedged against the foreign currency risk involved in foreign stocks. He said that it did, and we pointed out that the fund was using currency futures and forwards to do so, a form of derivative. This was a very intelligent, highly sophisticated executive, often quoted in the *Wall Street Journal* on important subjects. He just didn't think what he was doing involved derivatives, since it was *decreasing* the riskiness of his pension fund's investments, rather than *increasing* it.

If you have a home mortgage, you are probably using derivatives—to your benefit. In fact, your home mortgage may be full of derivatives. For example, it may contain a provision that allows

you to pay it off at any time, without any prepayment penalty. This gives you an *option* to prepay your loan, which is to your great advantage if interest rates go down and you want to refinance. You have a loan with an *embedded option*, which is a form of derivative. As another example, if you have a variable rate mortgage, the rate itself is probably derived from a common index such as the London interbank offered rate (LIBOR), or 11th district cost-of-funds index (COFI), which is the cost of funds charged by the Federal Reserve Bank in the 11th district. There may also be a limit on the increase in interest rates you pay, such as "the interest rate charged may not increase more than 1 percent in any six-month period." Or, there may be another limitation on interest rate increases over the life of the loan, such as "the interest rate charged may never exceed 10 percent per annum." Both of these provisions are *caps*, which are common in derivative instruments.

The purpose of this book is to help you use derivatives wisely by understanding derivatives and their application well enough to ask the right questions of yourself and your trusted advisers. Derivatives come in many forms, simple or complex, but you do not have to be a financial engineer with degrees in advanced mathematics to ask the right questions and decide whether a particular use of derivatives is right for you or your company.

FIDUCIARIES AND DERIVATIVES

Those responsible for investing other people's money are fiduciaries under the law. As such, it is their duty to balance the risk and reward of each potential investment and of all the portfolio investments as a group. The directors and top executives of the company have a supervisory responsibility over this function, just as they have a supervisory responsibility over the management and control of risks in all other areas of the business.

Of course, people with this responsibility cannot avoid taking some risks with the money in their care. Even risk-free investments in U.S. Treasury obligations can result in losses if the investment time is for a period that ends earlier or later than the maturity date. Investments in long-term Treasury bonds, backed by the full faith and credit of the United States, with no risk of default and absolute certainty that each payment of interest and principal will be timely made, lost about half their value from

1976 to 1981, as market interest rates rose and the present value of that future stream of certain cash payments declined.

The job is not to avoid risk altogether—an impossibility—but to strike a balance between risk and return that is suitable for the particular circumstances. The decision to invest in derivatives is like any other investment decision, and fiduciaries must understand the risks and rewards of the derivative investments they make. Derivatives may also be used to manage the risk and reward of other investments and business decisions. Fiduciaries must understand not only the risks and rewards of derivatives themselves, but also their use in the modern business world as an investment strategy and for risk management.

FOUR USES OF DERIVATIVES

Balancing risk and reward is necessary with or without derivatives. Adding derivatives to the picture provides another tool, or step, in the balancing process. Derivatives can be used in four basic ways:

- *Derivatives can be used as a convenient substitute for other investments, leaving risk and reward unchanged.* For example, instead of buying each of the stocks in the Standard & Poor's index of the 500 largest U.S. stocks, a pension fund might buy an S&P 500 futures contract of the same face value and set aside the full value in cash reserves. This strategy is no more or less risky than buying the stocks themselves, but uses futures as an efficient medium for investments.
- *Derivatives can be used to hedge other investments, reducing risk and reward, or to manage the risks inherent in a business.* For example, a pension fund that owns \$1 billion of large U.S. stocks, but fears that a temporary market decline is imminent, might sell \$1 billion of futures contracts, or buy \$1 billion of put options, to protect its portfolio against the risk of a general market decline.
- *Derivatives can be used speculatively to increase risk and reward through leverage.* For example, an investor with \$1 million could buy futures contracts with a face, or *notional*, value equal to \$10 million of stock. This investor is taking a big risk in hope of a big gain, leveraging the investment approximately 10 to 1. If the stock market goes up 10 percent, increasing the value of the