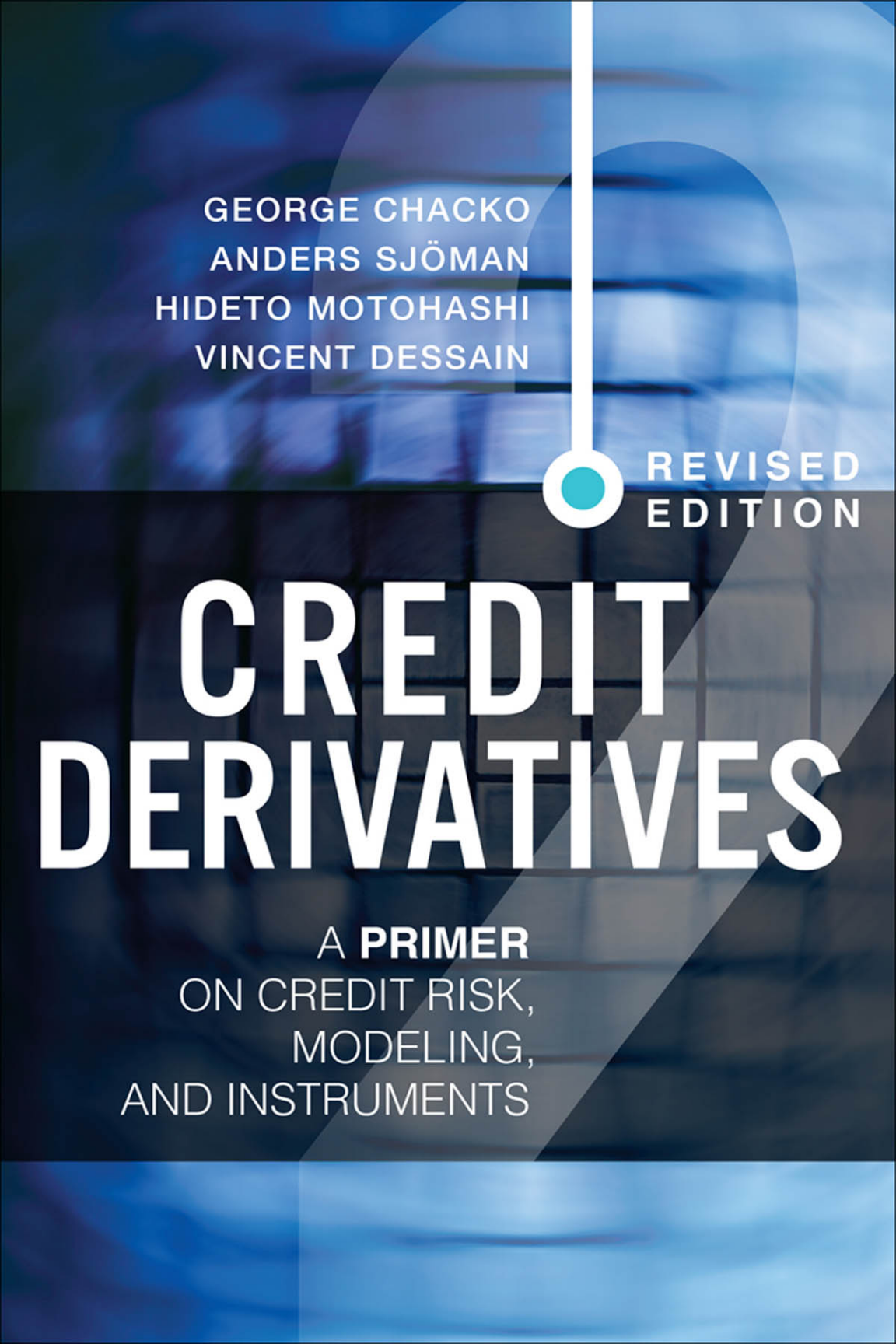
GEORGE CHACKO
ANDERS SJÖMAN
HIDETO MOTOHASHI
VINCENT DESSAIN
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CREDIT DERIVATIVES
A PRIMER ON CREDIT RISK, MODELING, AND INSTRUMENTS

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George Chacko
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CONTENTS

About the Authors v

Acknowledgments vii

Part I: What Is Credit Risk? 1

1 INTRODUCTION 3

2 ABOUT CREDIT RISK 9

Part II: Credit Risk Modeling 61

3 MODELING CREDIT RISK: STRUCTURAL APPROACH 63

4 MODELING CREDIT RISK: ALTERNATIVE APPROACHES 123

Part III: Typical Credit Derivatives 149

5 CREDIT DEFAULT SWAPS 151

6 COLLATERALIZED DEBT OBLIGATIONS 197

7 APPLICATIONS OF CREDIT DERIVATIVES AND FINANCIAL ENGINEERING 255

Index 283

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ABOUT THE AUTHORS

George C. Chacko is an Associate Professor and Chair of the Finance Department at Santa Clara University. Professor Chacko's research has focused on three areas: (1) transaction costs and liquidity risk in capital markets, particularly in the fixed income markets; (2) portfolio construction by institutions and individuals; and (3) the analysis and application of derivative securities. He was formerly an Associate Professor at Harvard Business School (HBS) in the Finance Department. On the commercial side, he is currently a Partner with HNC Advisors. He was formerly a Chief Investment Officer at Auda Alternative Investments, a Managing Director at IFL, and a Managing Director with State Street Bank. Professor Chacko holds a Ph.D. in business economics from Harvard University and dual master's degrees in business economics (Harvard University) and business administration (University of Chicago). He holds a bachelor's degree in electrical engineering from the Massachusetts Institute of Technology.

Anders Sjöman is the Head of the Communications Department at the Centre for Business History in Stockholm, Sweden. He has also served as a Vice President of Communications at Voddler and a senior researcher for Harvard Business School at its Paris-based Europe Research Center. Prior, Mr. Sjöman worked five years in Boston for Englishtown.com as Director of Production. A M.Sc. graduate of the Stockholm School of Economics in his native Sweden, and initially specialized in information management and international business, Mr. Sjöman speaks Swedish, English, French, and Spanish.

Hideto Motohashi is a senior manager at NTT DoCoMo. He has held several positions at NTT during his career. He was manager in the Financial System Division at NTT COMWARE Corporation, where he helped financial institutions with their risk management systems. His experience at NTT COMWARE also includes systems analysis for the financial and telecommunications industries. He was also a Vice President of Strategic Finance and Financial Planning at Tata Teleservices. Mr. Motohashi completed the Advanced Study Program

at Massachusetts Institute of Technology as a fellow. He holds a master's degree in international management from Thunderbird, the Garvin School of International Management, and a bachelor's degree in chemistry from Keio University, Japan.

Vincent Dessain was appointed executive director of the Europe Research Center for Harvard Business School, based in Paris, in November 2001. The center works with HBS faculty members on research and course development projects across the European continent. Prior, he was senior director of corporate relationships at INSEAD in Fontainebleau and on the school's board of directors. Mr. Dessain has been active as a management consultant with Booz-Allen & Hamilton in New York and Paris in the financial services field. His field of consulting was international market entry strategies, financial products, strategy, negotiation and implementation of cross-border alliances, financial restructuring, mergers, and acquisitions. He has also been active as a foreign associate with the law firm Shearman & Sterling in New York in banking and finance and as an advisor to the president of the College of Europe in Bruges, Belgium. A speaker of five European languages (French, English, German, Dutch, and Italian), Mr. Dessain holds a law degree from Leuven University (Belgium), a business administration degree from Louvain University (Belgium), and an MBA from Harvard Business School. Mr. Dessain is an avid mountain climber, marathon runner, and tennis player, and will not miss a good art exhibition

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1

INTRODUCTION

A Disease Known as Credit Risk

The following situation may sound familiar: A while ago, you lent money to a friend and the time has come for the friend to pay you back. You already worry, though, that your friend won't be able to pay back the loan. The idea that you might have to remind him is unpleasant; it makes you uneasy, queasy, almost to the point of nausea. Well, we are here to inform you that you have just been infected with the Credit Risk virus. And you won't be cured until the money is safely returned.

In the modern world, this is a virus as ordinary as the common cold. It does not limit itself to you or your friends. Credit risk touches anyone that extends a loan or has money due. It affects banks that offer loans to individuals, companies that give credit lines to their customers, and investors that buy corporate bonds from companies. In each of these examples, the credit taker—the individual, the clients, or the company—may not return the money or pay back the loan.

Put simply, credit risk is the risk that a borrower won't pay back the lender.

Of course, this should be expected when lending money—and it should be just as expected that the lender wants to evaluate how "safe" or credit worthy the borrower is. Banks run background checks on borrowers to avoid ending up with—in industry terms—a **non-performing** or **bad loan**. For instance, if an individual applies for a house purchase loan, the bank will automatically verify the applicant's history of bank

loans. This check of a person's credit worthiness answers several questions: Has he taken loans earlier, how big were they, and did he pay them back on time? Furthermore, are there assets that the bank can use as substitutes for payment—also known as **guarantees** or **collateral**—if the person does not pay back the loan? How valuable is the collateral, or rather, how much of the bank loan can the collateral pay back (sometimes referred to as the **recovery rate**)?

The same type of evaluation takes place if the borrower is a company. Picture a corporation that wants to build a new steel factory and applies for a loan to finance the factory. The bank will want to learn the history of the company. Is it knowledgeable about the steel industry? Has it built steel factories before? Does it have a credit rating from an external agency, such as Standard & Poor's or Moody's? What guarantees can it provide? A good bank will discuss all these issues before deciding whether to grant the steel factory a loan.

Credit risk is not limited to banks and their borrowers. Companies themselves are exposed to credit risk when they trade with customers and suppliers. In business, almost all companies are exposed to credit risk, simply because they do not ask for direct payments for products or services. Think of the standard payment program for a new car: The car dealership carries a credit risk, which slowly diminishes until the car is paid in full. Or, think of the typical company that ships its products with a bill specifying 30 days net payment: During those 30 days, and until payment has been made, the company is exposed to credit risk. As a result, companies often have to rely on its clients and trust their credit worthiness.

Companies also have to pay attention to their *own* credit risk. If the actors in the financial markets—such as banks and bond investors—believe that a company's credit worthiness has dropped, they will charge more for lending money to that firm, because they now have to factor in a higher perceived uncertainty and risk. For the firm, this means that its borrowing cost rises, as lenders demand a higher interest on loans than before. In other words, credit risk is a "disease" that can hit a company both as a lender and as a borrower.

Curing Credit Risk: Credit Derivatives

Several methods and instruments for handling credit risk have been developed over the years. Of course, the easiest way to avoid credit risk is to refuse making a loan. Although this may be a pretty infallible method of credit enhancement, it eliminates the possibility of making any kind of a profit. Other methods are less drastic. Some of them involve changing a company's business practices—for instance, asking for payment *before* the service or product is delivered. This is more natural for some businesses than others; popular examples include magazine subscriptions, health club memberships, or travel. If the company cannot manage this change in cash flow, it can still improve its credit exposure. For instance, the company mentioned earlier with a 30-days net payment practice can simply tighten the payment terms to, for example, 15 days. It can apply this practice across the board for all customers, or just for troubled clients with a history of paying late or not at all. Companies can also sign up for insurance products or ask for guarantees or letters of credit from their counterparts.

More advanced methods involve financial instruments known as **credit derivatives**.[1] Initially created by actors in the financial sector, such as banks and insurance companies, these tools are now also commonly used by regular commercial businesses. Credit derivatives include instruments such as total return swaps, credit spread options, and credit linked notes. They all serve the same primary purpose: to help companies and institutions reduce credit risk by separating out the credit risk part of an investment or asset and sell it onward. As an example, let's return to the bank that was considering making a loan to a steel factory. The bank believes in the project, and wants to grant the loan. However, it already has a number of loans outstanding to other steel factories, and worries about its overall exposure to the steel industry. If the steel sector were to experience economic difficulties, the bank would have a number of borrowers that might be unable to pay their interests or repay their loans. Therefore, to be able to grant the loan to the new steel factory, the bank (let's call it Bank A) turns to another bank (Bank B) and enters into an agreement using a credit derivative mechanism.

The agreement says that if the steel company stops its loan payments (or **defaults** on them, to use the industry jargon), Bank B will pay Bank A the amount in the place of the steel company. For this service, Bank A will pay a monthly fee to Bank B. Hopefully, the steel company will never default on its loan payments, but if it does, Bank A is now insured against the effects of that eventuality. On the one hand, Bank A's credit exposure improves. On the other, Bank B earns a monthly fee and wagers that the steel factory will probably not default on its loan.

This basic agreement is an example of a credit derivative (in this case, a **credit default swap**). Credit derivatives are financial instruments or contracts that allow a participant to decrease (Bank A in the preceding steel example) or increase (Bank B) its exposure to a particular type of credit risk for a specified length of time.

Who Suffers from Credit Risk?

This book is for anyone who suffers from credit risk, wants to understand the disease better, and wants to learn what there is to do about it. It is an introductory book—hence the word *Primer* in its title—and thus is not meant for the seasoned credit risk manager with years of credit experience. However, it is still a practitioner's book, written for the working professional and not for the academic researcher.

The book is a guide for industry, service, or finance professionals with an interest in credit risk and credit instruments. It is meant for investing institutions on the buy-side of the financial markets, such as mutual funds, pension funds, and insurance firms, as well as sell-side retail brokers and research departments. Our reader can be, for example, the chief financial officer (CFO) who wants to assess a proposal for a new credit derivative—or the investment banker who sits down to prepare the proposal.

How to Read This Book

Investors face all sorts of risk and not just credit risk. Grouping risks into different "baskets" helps investors choose which type(s) of risk to accept and which to leave for other investors. They might try to minimize **company-specific risk** through diversification, or use long-short strategies to cancel out **market risk** as they speculate on converging prices for individual securities. **Interest rate risk** is a common concern for anyone else looking to finance a large project. Investors who consume in one currency but invest in another are exposed to **currency risk**.

This book, however, addresses none of these risks. Instead, it focuses on another important risk that is often borne by investors, namely the risk that a company or individual cannot meet its obligations or liabilities on schedule: **credit risk**.

Part I, "What Is Credit Risk?," covers the basics of credit risk. It defines what credit is, what facing credit risk might entail, and also gives a short overview of some common credit derivative tools that transfer credit risk from those investors who do not want to bear it to those investors who are willing to accept it. The two chapters also discuss concepts such as default probabilities, recovery rates, and credit spreads.

After the introduction, Part II, "Credit Risk Modeling," then goes into detail on how credit risk models can be used to describe and predict credit risk events. It covers three different approaches to modeling credit risk: the structural, empirical, and reduced-form approaches. Chapter 3 focuses on structural models. It features the Merton model as an example of the approach, and also discusses the Black and Cox, and Longstaff and Schwartz models. Chapter 4 looks at empirical models, especially the Z-model, and reduced-form models, such as the Jarrow-Turnbull model.

Part III, "Typical Credit Derivatives," concludes the book by discussing in detail two specific credit derivative instruments used to transfer credit risk. Chapter 5 looks at credit default swaps (CDSs), Chapter 6 at collateralized debt obligations (CDOs), and Chapter 7 covers today's applications for financial instruments with embedded credit risk.

Endnotes

1 In financial jargon, a derivative is a financial instrument whose value is based on, or **derived from**, another security such as stocks, bonds, and currencies. For instance, a typical derivative is a stock option, which gives the holder the right but not the obligation to buy a company's stock at a future date. Derivatives can also be seen as contracts between two parties; its value then normally depends on a risk factor such as a credit event, an interest rate level, bond prices, currency changes, or even weather data. A credit derivative thus derives its value from a credit note, such as a corporate bond, just as a currency forward contract derives its value from currency exchange rates.

INDEX

A

ABSs (asset-backed securities), 198
Acme, Inc., balance sheets, 67
adjusted market value, 223
advance rates, market-value CDOs, 223-224
Altman's initial Z-score paper, 128-129
Altman, Edward I., 125, 129
American option, 72
arbitrage CDOs versus balance-sheet CDOs, 229
arbitrage motivated CDOs, 204-205
arrival rate, 136
arrivals, 135
asset price volatility, 87
asset value
  comparing Black and Cox model and Merton model, 114
  sensitivity analysis of Merton model, 104-106
asset value models, 66
asset volatility
  comparing Black and Cox model and Merton model, 115
  sensitivity analysis of Merton model, 101-102
asset-backed securities (ABSs), 198
assets, 66
attachment point, 201

B

bad loans, 3
balance sheets
  balance sheet motivated CDOs, 203-204
  structural credit risk models, 66-69
balance-sheet CDOs versus arbitrage CDOs, 229
Bank for International Settlements (BIS), 58
bankruptcies, 18, 199
  by geography, 37
  U.S. companies, 17
bankruptcy filings, U.S., 14-15
banks
  capital efficiency example, 260-272
  CDOs, 230-231
barrier function, Black and Cox model, 109-110
basis points, 59
basket CDSs, 49, 160-162
basket default swaps
  loss distribution, 185
  pricing, 181-187
    nondefault correlation portfolio, 183-186
    perfect default correlation portfolio, 182-183

BBA (British Bankers' Association), 55, 192
being long, 73
binary CDSs, 158-160
biotech company example (financial engineering), 272-277
BIS (Bank for International Settlements), 58
Black and Cox model, 70, 109
barrier function, 109-110
comparing to Merton model, 113-117
example of applying extension to Merton model, 111-113
Black, Fischer, 76, 108
Black-Scholes economy
applying Merton model, 84
assumptions underlying this approach, 87-88
Black-Scholes formula for call options, 85-86
Black-Scholes formula for put options, 87
Black-Scholes model, volatility value, 94
bonds, 12
commercial papers, 13
corporate bond market, 34
corporate bonds, 13
corporate bonds with risk premium, 24
corporate bonds without risk premium, 23
government bonds, 13
public and private bond market debt, U.S., 33
redemption features, 14
risk-free bonds, 13
U.S. Treasury Bonds, 13
zero-coupon bonds, 14
book value, 132
breaking points, 71
British Bankers' Association (BBA), 55, 192
business objectives. *See* financial engineering

C

calculating
credit spread, 25-26
debt value, Merton model, 90-92
expected default payment, 234
risk-neutral default probability, 96-97
call options, 52, 71-72
Black-Scholes formula, 85-86
synthetic credit risk example, 275-277
capital efficiency example (financial engineering), 260-272
cash CDOs, 200, 206
cash flows
arbitrage motivated CDOs, 205
basket CDSs, 162
CDO squared, 209
CDOs, 199
CDOs of EDS, 210
digital CDSs, 160
interest rate swaps, 153
iTraxx, 168
plain vanilla CDSs, 158
portfolio CDSs, 164
swap contracts, 257-260
synthetic CDOs, 207

cash settlement, 157
cash-flow CDOs, 212-222
O/C and I/C, 215-222
cash-flow period, life cycle of CDOs, 203
cash-flow waterfall, cash-flow CDOs, 214
CBOs (collateralized bond obligation), 52, 197
CDO market, 228-231
CDO squared, 209-210
CDO2, 209
CDOs (collateralized debt obligations), 52, 151, 197-203
arbitrage motivated CDOs, 204-205
balance sheet motivated CDOs, 203-204
balance-sheet CDOs versus arbitrage CDOs, 229
cash CDOs, 206
cash flows, 199
CDO squared, 209-210
CDOs of EDS, 210-211
credit enhancement provisions, 211
cash-flow CDOs, 212-222
market-value CDO, 212-213
life cycle, 203
market-value CDOs. *See* market-value CDOs
pricing, 227-228, 232-234
Cholesky decomposition, 239-240
comparing protection leg and premium leg to arrive at a fee, 237
Copula model, 251-252
with correlation using a Monte Carlo simulation, 244-251
with no correlation using a Monte Carlo simulation, 241-244
premium leg, 236-237
protection leg, 234-236
simulating default outcomes to arrive at a price, 238-239
protection buyers, 230
protection sellers, 230
seniority, 200
synthetic CDOs, 206-208
tranches, 201-203
CDOs of EDS, 210-211
CDS market, 192-194
CDSs (credit default swaps), 48-49, 56, 151-152, 155-156
basket CDSs, 160-162
customized, 260
digital CDSs, 158-160
indices, 164-168
interest rate swaps, 152-154
leg, 169
multiname CDSs. *See* multiname CDSs
plain vanilla CDSs, 156-158
portfolio CDSs, 162-164
premium leg, 169
pricing, 168-169
pricing swaps, 154-155
protection leg, 169
protection sellers, 194
single-name CDSs, 160
pricing with structural approach, 169-175

pricing with reduced form approach, 175-177
Cholesky decomposition, 233, 239-240
Cholesky, Andre-Louis, 239
CLNs (credit linked notes), 49-51
CLOs (collateralized loan obligations), 19, 52, 197, 263-272
CMOs (collateralized mortgage obligations), 52, 197
collateral, 4, 59
collateralized bond obligation (CBO), 52, 197
collateralized debt, 53
collateralized debt obligations. *See* CDOs
collateralized loan obligations (CLOs), 19, 52, 197, 263-272
collateralized mortgage obligations (CMOs), 19, 52, 197
collateralized products, 52
Colombia Healthcare, 38
commercial papers, 13
commodity swap contracts, 257-260
companies, defaulting on loans, 15-17
company-specific risk, 7
comparing Black and Cox model and Merton model, 113-117
Copula model, 251-252
corporate bond market, 34
corporate bond with risk premium, 24
corporate bond without risk premium, 23
corporate bonds,sinking fund provision, 13
correlation
Cholesky decomposition, 239-240
defaults. *See* default correlation
pricing CDOs using a Monte Carlo simulation, 244-251
countries, defaulting on loans, 17
coupon payments, 14
coupons, 10
coverage tests, 213-222
covered option, 121
Cox, J.C., 108
credit
defined, 10
types of, 11-14
credit default option, 194
credit default spread premium, 156
credit default swap spread, 156
credit default swaps. *See* CDSs
credit derivatives, 5-6, 44-46
credit derivatives market, 53-54
market participants, 55-56
product usage, 56-57
regional markets, 54
underlying reference assets, 57-58
credit enhancements provisions
CDOs, 211
cash-flow CDOs, 212-222
market-value CDOs, 212-213

market-value CDOs, 223
advance rates and over-collateralization tests, 223-224
example using advance rates to calculate over-collateralization ratios, 224-227
credit event after merger, 18
credit events, 18
credit exposure, 20
credit linked notes (CLNs), 49-51
credit rating, recovery rate, 42
credit rating agencies, 26-27
credit ratings
evaluating default probability, 27, 30-31
one-year ratings transition matrix, 31
credit risk, 3-4
defined, 9, 20
measuring through credit spread, 21-24
reducing, 5-6
synthetic credit risk example, 272-277
who suffers from credit risk?, 6
credit risk instruments, 45
credit risk models
empirical credit risk models, 65
reduced form models, 65
structural credit risk models, 65-66
balance sheet, 66-69
limitations, 69
Merton model. See Merton model
option pricing, 70
types of, 70
structure of, 64
credit risk statistics, 33-35
default rates, 35-38
recovery rates, 40-43
credit scoring models, 124-125
Z-score model, 125-127
Altman's initial Z-score paper, 128-129
example, 130-131
Z'-score, 132-133
Z"-score, 133-134
credit spread, 21-22
calculating, 25-26
corporate bond with risk premium, 24
corporate bond without risk premium, 23
determining with Merton model, 92
irregularities, 100-101
risk-free government bond, 23
credit spread options (CSOs), 51-52
credit spread sensitivity
against maturity time by default intensity, Jarrow-Turnbull model, 145-146
against maturity time by recovery rate, Jarrow-Turnbull model, 147
credit structures, CDOs, 212
creditors, 10
cross-default provisions, 108

CSOs (credit spread options), 51-52
currency, 11
currency risk, 7
customized CDSs, 260

D

debt
investment grade debt, 26
junior debt, 19
junk bonds, 26
Merton model, 79-82
mortgage related debt, 34
non-investment grade, 26
public and private bond market debt, U.S., 33
risky debt, Merton model, 76
senior debt, 19
speculative grade, 26
debt obligations, 12-14
debt value
calculating with Merton model, 90-92
sensitivity analysis of Merton model, 106-107
debt waterfalls, 19
debtors, 10
default, 6
credit events, 18
default correlation, 177, 232
basket default swaps, 181-182
multiname CDSs, 178-179
default data, evaluating default probability, 27, 30-31
default intensity, 135-137
credit spread sensitivity against maturity time by default intensity, Jarrow-Turnbull model, 145-146
Jarrow-Turnbull model, 142-143
over time, 137-140
default intensity modeling, 135
default probability, 21, 232
evaluating, 26-27
credit ratings and default data, 27, 30-31
example of difficulty in rating, 31-33
risk-neutral, 96-97
default process, 19
default rates, 35-36
by geography, 36-38
by industry sector, 38
for 1994, 30
default remoteness, 199
default risk. *See* credit risk
default timing, Merton model, 107
default-free bonds, 13
default-free rate, 23
defaulting on loans, 14
companies, 15-17
countries, 17
individuals, 14
derivatives, 8
diffusion process, 119
digital CDSs, 158-160
distribution, loss distribution, 177
distribution model, 148
diversification, 278

Dow Jones CDS indices, 165
Dow Jones iTraxx, 164-165
cash flows, 168
example, 165-168

E

EAD (exposure at default), 20
EBIT/TA (earnings before interest and taxes/total assets), 127
EDS (equity default swaps), 208
CDOs of EDS, 210-211
empirical credit risk models, 65
empirical models. *See* credit scoring models
equity, 66, 71
Merton model, 78-79, 82-83
equity default swaps. *See* EDS
equity value, finding debt value by calculating equity value (Merton model), 90-91
Euro LIBOR, 166
European options, 72
evaluating default probability, 26-27
credit ratings and default data, 27, 30-31
example of difficulty in rating, 31-33
exercise date, 72
expected default payment, protection leg (CDOs), 234-236
expected loss, 22
expiration date, 12
exponential function, 148
exposure at default (EAD), 20
extending Merton model, 107-108
barrier function, 109-110
example of applying Black and Cox's extension, 111-113
Longstaff and Schwartz, 117

F

failure to pay, 18
financial engineering
capital efficiency example, 260-272
defined, 255
power plant conversion example, 256-260
securitized risk conveyance example, 278-280
synthetic credit risk example, 272-277
finding
debt value by calculating equity value, 90-91
default intensity, Jarrow-Turnbull model, 142-143
First Passage model. *See* Black and Cox model
first-to-default (FTD) basket CDSs, 49, 160
fixed-recovery CDSs. *See* digital CDSs
FLP (First-to-Loss Protection), 49

G

generic swap contracts, 257-260
going long, 74
going long the credit, 157
going short the credit, 157

government action, credit events, 18
government bonds, 13
grey zone, 129
guarantees, 4

H-I

haircut asset value, 223

I/C (interest coverage) tests, 215-222
IMF (International Monetary Fund), 17
implied volatility, 94
in-the-money, 79
indenture, 122
indices, CDSs, 164-165
  example, 165-168
individuals, defaulting on loans, 14
industries
  default rates, 38
  recovery rate, 42-43
inflation, interest, 11
insurance, 156
insurance companies
  CDOs, 231
  financial engineering example, 278-280
interest, 10-11
interest cash-flow waterfall, 218
interest coverage (I/C) tests, 215-222
interest rate risk, 7
interest rate swaps, 152-154
interest rates, 44
  comparing Black and Cox model and Merton model, 115
  sensitivity analysis of Merton model, 103-104
International Monetary Fund (IMF), 17
investment grade, 26
iTraxx, 164-165
  cash flows, 168
  example, 165-168
iTraxx Europe, 166

J-K

Jarrow-Turnbull model, 134, 141
  credit spread sensitivity against maturity time by default intensity, 145-146
  credit spread sensitivity against maturity time by recovery rate, 147
  default intensity, finding, 142-143
  example, 143-144
  sensitivity analysis, 144-145
joint default probability, 232
junior debt, 19
junk bonds, 26

L

leg, 154
  CDSs, 169
liabilities, 66
LIBOR (London Inter Bank Offered Rate), 58, 152
life cycle of CDOs, 203

limitations, structural credit risk models, 69
loans, 11. *See also* CLOs
bad loans, 3
defaulting on loans. *See* defaulting on loans
mortgages, 12
non-performing loans, 3
lognormal distribution, 88
London Inter Bank Offered Rate (LIBOR), 58, 152
Longstaff and Schwartz model, 117-121
example of applying, 119-121
sensitivity analysis, 121
loss distribution, 177
basket default swaps, 185
multiname CDSs, 179-181
portfolio default swap, 190-191

M

marked-to-market, 212
market disruptions, credit events, 18
market participants, credit derivatives market, 55-56
market risk, 7
market value, 132
market value of equity/book value of total liabilities (MVE/TL), 127
market-value CDOs, 212-213
credit enhancements, 223
advance tests and over-collateralization tests, 223-224
example using advance rates to calculate over-collateralization ratios, 224-227
markets
CDO market, 228-231
CDS market, 192-194
maturity date, 12, 72
measuring credit risk through credit spread, 21-24
Merton model, 66, 70, 76
applying in Black-Scholes economy, 84
assumptions underlying this approach, 87-88
Black-Scholes formula for call options, 85-86
Black-Scholes formula for put options, 87
comparing to Black and Cox model, 113-117
debt interpretation, 79-82
default timing, 107
equity interpretation, 78-79, 82-83
equity payoff as a function of asset value, 77
example, 89-90, 93-96
arriving at the credit spread, 92
balance sheet, 93
calculating debt value directly, 91-92
finding debt value by calculating equity value, 90-91

extending, 107-108
barrier function, 109-110
example of applying Black and Cox's extension, 111-113
Longstaff and Schwartz, 117
option pricing, 83
payoff of a zero-coupon Treasury Bond, 79-80
risk-neutral default probability, 96-97
risky debt, 76
sensitivity analysis, 97-101
asset value, 104-106
asset volatility, 101-102
debt value, 106-107
interest rates, 103-104
Merton, Robert C., 66, 76
mezzanine tranches, 250
models
asset value models, 66
Black and Cox model. *See* Black and Cox model
Copula model, 251-252
credit risk models. *See* credit risk models
credit scoring models. *See* credit scoring models
default intensity modeling, 135
empirical models. *See* credit scoring models
Longstaff and Schwartz. *See* Longstaff and Schwartz model
Merton model. *See* Merton model
reduced form models. *See* reduced form models
Money Market, 34
Monte Carlo simulation, 234
pricing with correlation, 244-251
pricing with no correlation, 241-244
Moody, credit rating system, 27
moral hazard dilemma, 203
mortgage related debt, 34
mortgages, 12
multiname CDSs, 160
pricing, 177
basket default swaps, 181-187
default correlation, 178-179
loss distribution, 179-181
portfolio default swap, 187-191
MVE/TL (market value of equity/book value of total liabilities), 127

N

naked option, 121
non-investment grade, 26
non-performing loans, 3
nondefault correlation portfolio, basket default swaps, 183-186
notional amount, 154
nth-to-default basket CDSs, 160

O

O/C (overcollateralization) tests, 215-222
market-value CDOs, 223-224
obligor, 10

option pricing, 66
Merton model, 83
structural credit risk models, 70
options
American options, 72
being long, 73
call options, 71-72
covered option, 121
defined, 71
equity, 71
European options, 72
going long, 74
naked option, 121
payoffs for holding options, 73
payoffs for selling options, 74-75
put options, 71, 73
shorting the option74
OTC (over-the-counter) market, 53
out-of-the-money, 79
over-the-counter (OTC) market, 53
overcollateralization (O/C) tests, 215-222
market-value CDOs, 223-224

P

payoffs
for holding options, 73
for selling options, 74-75
physical settlement, 157
plain vanilla credit default swaps, 156-158
Poisson distribution, 136
Poisson event, 135
portfolio CDSs, 162-164
portfolio default swap
loss distribution, 190-191
pricing multiname CDSs, 187-191
portfolio products, 52
power plant conversion example (financial engineering), 256-260
premium leg
CDOs, 236-237
CDSs, 170
pricing, 170-171
pricing
CDOs, 227-228, 232-234
Cholesky decomposition, 239-240
comparing protection leg and premium leg to arrive at a fee, 237
Copula model, 251-252
premium leg, 236-237
protection leg, 234-236
simulating default outcomes to arrive at a price, 238-239
with correlation using a Monte Carlo simulation, 244-251
with no correlation using a Monte Carlo simulation, 241-244
CDSs, 168-169
pricing single-name CDSs using the reduced form approach, 175-177
pricing single-name CDSs using the structural appraoch, 169-175

multiname CDSs, 177
basket default swaps, 181-187
default correlation, 178-179
loss distribution, 179-181
portfolio default swap, 187-191
premium leg, 170-171
protection leg, 171-173
swaps, 154-155
principal, 10
principal value of debt, comparing Black and Cox model and Merton model, 116
probability, calculating risk-neutral default probability, 96-97
products, credit derivatives market, 56-57
protection buyers, 157
CDOs, 230
CDSs, 193
protection leg
CDOs, expected total default payment, 234-236
CDSs, 169
pricing, 171-173
protection sellers, 46, 157
CDOs, 230
CDSs, 194
put options, 71, 73
Black-Scholes formula, 87

Q-R

quantitative scores, 124

ramp-up period, life cycle of CDOs, 203
random walk, 121
ratings transition matrix, 31
RE/TA (retained earnings/total assets), 126
recovery rate, 4, 19, 21-22
credit spread sensitivity against maturity time by recovery rate, Jarrow-Turnbull model, 147
recovery rates, 40
by credit rating, 42
by industry, 42-43
by seniority, 40
redemption features, bonds, 14
reduced form models, 65, 134-135
default intensity, 135-137
over time, 137-140
pricing single-name CDSs, 175-177
reducing credit risk, 5-6
regional markets, credit derivatives market, 54
regression analysis, 148
reinsurance, 278-280
reinvestment period, life cycle of CDOs, 203
replicated swaps, 155
resecuritization, 209
retained earnings, 126
retained earnings/total assets (RE/TA), 126
retiring the bond, 13
return on equity (ROE), 262-272
risk buyer, 157
risk hedger, 157
risk mitigation (insurance company example), 278-280
risk premium, 22

risk-free bonds, 13
risk-free government bond, 23
risk-neutral default probability, calculating, 96-97
ROE (return on equity), 262-272

S

S&P, credit rating system, 27
S/TA (sales/total assets), 127
safety covenants, 108
sales/total assets (S/TA), 127
second to default (STD), 160
securitization, 198
securitized risk conveyance example (financial engineering), 278-280
sellers, protection sellers. ***See*** **protection sellers**
senior debt, 19
seniority, 19
  CDOs, 200
  recovery rate, 40
sensitivity analysis
  Jarrow-Turnbull Model, 144-145
  Longstaff and Schwartz model, 121
  Merton model. *See* Merton model
shortfall, 226
shorting the option, 74
significant downgrading of credit rating, 18
simulating default outcomes to arrive at a price, CDOs, 238-239
single-name CDSs, 160
  pricing using the reduced form approach, 175-177
  pricing using the structural approach, 169-175
sinking fund provision, 13
SPCs (special purpose companies), 50
speculative grade, 26
SPEs (special purpose entities), 50, 199
SPVs (special purpose vehicles), 199
  capital efficiency example, 263-266
  reinsurance example, 279-280
  synthetic credit risk example, 274-277
stale sources, 32
Standard & Poor's 500 Index, 194
STD (second-to-default), 160
stress scenarios, 22
strike price, 72
structural approach, pricing single-name CDSs, 169-175
  example, 173-175
  premium leg, 170-171
  protection leg, 171-173
structural credit risk models, 65-66
  balance sheet, 66-69
  limitations, 69
  Merton model. *See* Merton model
  option pricing, 70
  types of, 70
swap contracts, 257-260. ***See also*** **CDSs**

synthetic CDOs, 206-208
synthetic CLOs, 270
synthetic credit risk example (financial engineering), 272-277

T

T-Bills (Treasury Bills), 13
term-to-maturity, 13
the diffusion, 119
the drift, 119
third-to-default, 160
time value, 11
total return swap, 47-48
tranches, 52, 197
  CDOs, 201-203
  mezzanine tranches, 250
Treasury Bills (T-Bills), 13
types of
  credit, 11-14
  structural credit risk models, 70

U

U.S.
  bankruptcies, companies, 17
  bankruptcy filings, 14-15
  public and private bond market debt, 33
U.S. Treasury Bonds, 13
Ulam, Stanislaw, 252
underlying reference assets, credit derivatives market, 57-58
unwind period, life cycle of CDOs, 203

V

volatility
  asset price volatility, 87
  asset volatility
    comparing Black and Cox model and Merton model, 115
    sensitivity analysis of Merton model, 101-102
  implied volatility, 94

W

Wal-Mart, 2004 financials, 130
WC/TA (working capital/total asset), 126
working capital, 126
WorldCom, 32
  example of the difficulty in rating, 31-33

X-Y-Z

yield, 59

Z"-score, 133-134
Z'-score, 132-133
Z-score model, 125-127
  Altman's initial Z-score paper, 128-129
  example, 130-131
  revised Z-score model, 132-134
zero-coupon bond, 14