



# CREDIT

# Derivatives

A Primer on Credit Risk, Modeling,  
and Instruments

GEORGE CHACKO | ANDERS SJÖMAN

HIDETO MOTOHASHI | VINCENT DESSAIN

# CREDIT DERIVATIVES

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George Chacko  
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© 2006 by Pearson Education, Inc.  
Publishing as Prentice Hall  
Upper Saddle River, New Jersey 07458

Prentice Hall offers excellent discounts on this book when ordered in quantity for bulk purchases or special sales. For more information, please contact U.S. Corporate and Government Sales, 1-800-382-3419, [corpsales@pearsontechgroup.com](mailto:corpsales@pearsontechgroup.com). For sales outside the U.S., please contact International Sales at [international@pearsoned.com](mailto:international@pearsoned.com).

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Printed in the United States of America

Third Printing: August 2007

ISBN 0-13-146744-1

Pearson Education LTD.  
Pearson Education Australia PTY, Limited.  
Pearson Education Singapore, Pte. Ltd.  
Pearson Education North Asia, Ltd.  
Pearson Education Canada, Ltd.  
Pearson Educación de México, S.A. de C.V.  
Pearson Education—Japan  
Pearson Education Malaysia, Pte. Ltd.

Library of Congress Cataloging-in-Publication Data

Credit derivatives : understanding credit risk and credit instruments / George Chacko ... [et al.].  
p. cm.

ISBN 0-13-146744-1 (alk. paper)

1. Credit derivatives. 2. Risk. I. Chacko, George.

HG6024.A3C75 2006

332.64'57—dc22

2005036789

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# ACKNOWLEDGMENTS

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We could not have completed this book without the generous assistance from colleagues at Harvard Business School and other academic institutions, students in our courses, practitioners in the field, and numerous other people. As a group we are particularly indebted to Penelope Fairbairn for her sharp proofreading eyes and precise content questions. We owe any success this book might have to the kind participation of all these people. Any errors remain naturally our own.

In addition, **George** would like to thank his friends and family for mental support, and the Harvard Business School Division of Research for financial support.

**Anders** embraces Lotta, Vilgot, Liselotte, and Johannes.

**Hideto** would like to thank his wife Lin-an and his son Keiya.

Finally, **Vincent** gives thanks from the bottom of his heart to Stéphanie.

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# 1

## INTRODUCTION

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### 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**.<sup>1</sup> 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) and Chapter 6 at collateralized debt obligations (CDOs).



# Endnotes

- <sup>1</sup> 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.

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