Counterparty Credit Risk

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Counterparty Credit Risk

The New Challenge for Global Financial Markets

Jon Gregory

WILEY

A John Wiley and Sons, Ltd, Publication

This edition first published in 2010

Registered office
John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

ISBN 978-0-470-68576-1

A catalogue record for this book is available from the British Library.

Project Management by OPS Ltd, Gt Yarmouth, Norfolk
Typeset in 10/12pt Times
Printed in Great Britain by CPI Antony Rowe Ltd, Chippenham, Wiltshire

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Acknowledgements

I would first like to acknowledge Michael Pykhtin and Dan Rosen who initially had the idea for this book, which they discussed with me in Geneva in December 2008. I would like to further thank Michael Pykhtin for reading and providing invaluable comments on initial chapters and for collaborating on the writing of Chapter 11. I have been lucky to be able to call on informal referees for draft chapters, namely Kirk Buckley, Darrell Duffie, Alex Gu, Andrew Green, Jean-Paul Laurent, Matthew Leeming, John Ovens, Vladimir Piterbarg, David Rowe, Lutz Schloegl and Tom Wilde. I am very grateful to these people for reading early drafts of chapters and putting up with the spelling mistakes and bad grammar to provide some invaluable suggestions. Needless to say, I take responsibility for any remaining errors.

I would like to thank Pete Baker, Aimee Dibbens and Viv Wickham at John Wiley & Sons for their excellent support during this project and to Neil Shuttlewood at OPS for working so quickly and efficiently at the copy-editing stage.

Thanks finally to my daughter Christy, son George and wife Ginnie for putting up with me during the writing process.

Jon Gregory
December 2009

Spreadsheets

The following spreadsheets have been prepared to allow the reader to gain some simple insight into some of the quantitative aspects discussed in the main text. The spreadsheets can be downloaded freely from my website *www.oftraining.com* under the counterparty risk section. Many of these examples have been used for training courses and have therefore evolved to be quite intuitive and user-friendly. New examples will be added over time. Any questions then please email me at *jon@oftraining.com*

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Abbreviations

ABS	Asset-Backed Security
AIG	American International Group Inc.
AIGFP	AIG Financial Product
ASW	Asset SWap
ATE	Additional Termination Event
BCBS	Basel Committee on Banking Supervision
BCVA	Bilateral Credit Value Adjustment
BSM	Black–Scholes–Merton
CAPM	Capital Asset Pricing Model
CCDS	Contingent Credit Default Swap
CCF	Credit Conversion Factor
CCP	Central CounterParty
CDO	Collateralised Debt Obligation
CDPC	Credit Derivative Product Company
CDS	Credit Default Swap
CEM	Current Exposure Method
CF	CashFlow
CFTC	Commodity Futures Trading Commission
CLN	Credit-Linked Note
CPPI	Constant Proportion Portfolio Insurance
CPU	Central Processing Unit
CRG	Counterparty Risk Group
CSA	Credit Support Amount
CSO	Collateralised Synthetic Obligation
CVA	Credit Value Adjustment
DBL	Drexel–Burnham–Lambert
DC	Determination Committee
DD	Distance to Default
DPC	Derivatives Product Company (or Corporation)
EAD	Exposure At Default
EDF	Expected Default Frequency
EE	Expected Exposure

EEPE	Effective Expected Positive Exposure
EPE	Expected Positive Exposure
ERM	Enterprise Risk Management
ETO	Early Termination Option
EVT	Extreme Value Theory
FX	Foreign eXchange
G10	Group of Ten
GCM	General Clearing Member
ICM	Individual Clearing Member
IMM	Internal Model Method; International Monetary Market
IRB	Internal Ratings Based
IRS	Interest Rate Swap
ISDA	International Swaps and Derivatives Association
LGD	Loss Given Default
LHP	Large Homogeneous Pool
LIBOR	London Inter-Bank Offer Rate
LSS	Leveraged Super Senior
LTCM	Long Term Capital Management
MA	Maturity Adjustment
MBS	Mortgage-Backed Security
MMR	Modified Modified Restructuring
MR	Modified Restructuring
MTA	Minimum Transfer Amount
MtM	Mark-to-Market
NA	North American
NAV	Net Asset Value
NCM	Non-Clearing Member
NGR	Ratio of current Net exposure to current GRoss exposure
NN	No Netting
NS	Netting Set
OTC	Over The Counter
PD	Probability of Default
PFE	Potential Future Exposure
PWC	PriceWaterhouseCooper
RC	Regulatory Capital
RED	Reference Entity Database
S&P	Standard & Poor
SFAS	Standards of Financial Accounting Statement
SFT	Structured Finance Transaction
SIV	Structured Investment Vehicle
SM	Standardised Method
SPAN	Standard Portfolio Analysis of Risk
SPE	Special Purpose Entity
SPV	Special Purpose Vehicle
TRS	Total Return Swap
VAR	Value-at-Risk
WR	Withdrawn Rating

Introduction

THE NEW CHALLENGE FOR GLOBAL FINANCIAL MARKETS

In 2007 we started to experience what would be the worst financial crisis since the 1930s. The crisis spread from origins in the United States to become a global crisis. It also spread rapidly from the financial markets to have a significant impact on the real economy. Some financial institutions failed including the extremely high profile bankruptcy of the investment bank Lehman Brothers founded in 1850. Even more financial institutions would have failed were it not for government bailouts.

The first decade of the 21st century has been disastrous for derivatives and financial risk management. One area that needs special attention is that of counterparty credit risk, often known simply as counterparty risk. Counterparty risk arises from the credit risk in securities financing transactions such as repos and the vast and often complex OTC (over-the-counter) derivatives market. For example, Lehman Brothers had a notional amount of $800 billion of OTC derivatives at the point of bankruptcy. In addition, the complex web of transactions, collateral positions and structures such as SPVs (special purpose vehicles) needing to be unwound during the Lehman's bankruptcy has provided a reminder of the presence and complexity of counterparty risks within the financial system.

The use of derivatives among companies is widespread although the majority of the risk is centralised among financial institutions and further concentrated amongst the largest banks or "dealers". Non-financial users of derivatives tend to apply them only for hedging specific risks. Banking institutions did not fail because of unprofitable OTC derivatives-trading activities. However, derivatives do have the potential to create a complex web of transactions and also allow much of the leverage that can bring about major market disturbances. Furthermore, the complexity and bilateral nature of derivatives, together with the rapidly moving financial markets, means that the financial instability of a large institution can easily cause major shockwaves through the entire highly connected financial system.

Whilst Lehman Brothers was the only high-profile default of the credit crisis, many other large financial institutions (for example, Bear Stearns, AIG, Fannie Mae, Freddie Mac, Merrill Lynch, Royal Bank of Scotland) needed external support (mainly government) to avoid their failure. The "too big to fail" mentality that seemingly existed in the

market has been thoroughly discredited and the failure or financial instability of any institution large or small should be regarded as plausible. A key concern around the default of a large financial institution is the systemic risk arising from a cascade of events that could lead to a major crisis within the financial markets. Such systemic risk episodes are of great concern and therefore need to be strongly mitigated against.

A lack of proper assessment of credit exposure and default probability was a key driver of the credit crisis from 2007 onwards. The too-big-to-fail illusion meant that many counterparties were given (perhaps only implicitly) zero or close to zero default probability. Rating agencies were able to earn income from assessing securities that were potentially far riskier than indicated by their given rating which in many cases turned out to be inaccurate and of little value. Many years of laziness in assessing credit risk led to a major crisis. Lessons need to be learned, a key one being that all institutions must improve their understanding, quantification and management of their counterparty risks.

OVERVIEW OF THIS BOOK

This book is a comprehensive guide to the subject of counterparty risk for practitioners dealing with this or related topics. All aspects of counterparty risk and related areas are discussed. Whilst financial risk management has tended to be rather quantitative in recent years, there is a well-known danger in overuse of models and quantitative methods. We aim to strike a balance by including quantitative material in appendices for the book, which are not compulsory. The main text can be read freely by the non-quantitative reader whilst appendices may be consulted by those wishing to go into more detail on the underlying mathematical points. There are also spreadsheet examples accompanying the book that can be freely downloaded (see p. xviii).

We begin the book with two introductory chapters: *Chapter 1* sets the scene and describes counterparty risk in context with other financial risks (market, liquidity, operational, credit) and concepts such as VAR (value-at-risk). *Chapter 2* introduces and defines counterparty risk, explaining the product coverage, components and important terminology and discusses many of the key topics that will be covered in more detail in later chapters.

Netting and collateral reduces counterparty risk substantially with the overall exposure of firms reduced to a small fraction of their gross exposure. In *Chapter 3* we discuss these risk mitigation techniques together with others such as termination events and the use of default-remote entities that have been much utilised to limit counterparty risk. We also describe the importance of mitigation techniques in allowing the OTC derivatives market to grow exponentially in size and we consider the potential dangers of the benefits of risk mitigation being overestimated.

Derivatives can fluctuate from an asset to a liability position, hence both parties face credit exposure over time. An important consideration for many financial institutions for many years has been the modelling of credit exposure and its use, together with credit lines, to control counterparty risk. *Chapter 4* is dedicated to discussing the quantification of credit exposure and describing methodologies, models and systems requirements. *Chapter 5* follows on with a discussion on quantifying credit exposure in the presence of collateral agreements. With collateralisation becoming increasingly important and com-

mon, there is particular relevance to understand fully the extent to which collateral agreements change future credit exposure.

Between 2001 and 2007, the notional value of outstanding credit default swaps (CDSs) grew by a factor of 100. Due to the turbulence in the credit markets, the counterparty risk problem became critical for the financial industry and resulted in a dramatic shrinkage of the market. *Chapter 6* is an introduction to credit risk and credit derivatives for readers not experienced in this area and then covers more complex aspects of the credit derivatives market that will be useful knowledge for later chapters. We describe recent developments such as the "Big Bang Protocol" introduced to improve market transparency and liquidity and agreed to by the majority of banks, hedge funds and asset managers trading CDSs. We also describe some of the intricacies of portfolio credit derivatives and, in particular, super senior tranches that will be part of important discussions in later chapters regarding monoline insurers and so-called wrong-way risk.

There has been substantial interest recently for banks and other financial institutions to price dynamically their counterparty risk and so to fairly charge all future counterparty risk losses at the point of origin (e.g. an individual trader). *Chapter 7* discusses the intricacies involved in computing credit value adjustment (CVA) as a means to price counterparty risk and the inclusion of all risk mitigants within the pricing. Also discussed is the practice of including one's own default in the assessment of counterparty risk, so-called bilateral CVA or DVA (debt value adjustment). This is an important and hotly debated theme at the current time for institutions with large counterparty risk exposures. Chapter 7 is the most complex chapter but, with the mathematical formulae in optional appendices, should be also accessible to less technically minded readers.

Chapter 8 continues the discussion on CVA but without the usual simplifying assumption that there is no wrong-way risk. Wrong-way risk causes CVA to increase substantially and we analyse specific cases of relevance such as interest rate, foreign exchange and commodity contracts. Extensive focus is given to credit derivatives since the counterparty risk inherent in these instruments has been blamed for playing a pivotal role in the collapse of Lehman Brothers and the failure of AIG. All this makes the evaluation and hedging of CVA for CDSs vital for the financial system as a whole.

As well as being driven by institutions wanting to value properly counterparty risk, the need for CVA is also strongly driven by accountancy regulations, which require the fair valuation of the counterparty risk of derivatives positions. Since CVA is necessarily driven by market-implied parameters, then it will be important for most firms to hedge or at least limit certain sensitivities, for example due to credit spreads. Failure to do this will lead to highly volatile CVA numbers and potentially severe mark-to-market losses due to counterparty risk. *Chapter 9* considers hedging aspects with the focus on practical strategies that are used by some large banks rather than theoretical ideas that cannot be put into practice.

Portfolio credit risk and associated economic capital concepts have been an important topic for well over a decade. In *Chapter 10* counterparty risk portfolio aspects are introduced from the two-name case, relevant for contracts known as contingent credit default swaps (CCDSs) to the multi-name case, relevant for quantification of unexpected losses and economic capital. We discuss the treatment of random exposures in a credit portfolio framework. The regulatory side of portfolio counterparty risk, largely in relation to Basel II, is discussed in *Chapter 11*, which covers aspects such as the

double-default rules for hedged counterparty risks and the treatment of derivatives exposures under the IRB (internal rating based) approach of Basel II.

With the quantification, mitigation, pricing, hedging and regulation of counterparty risk increasing in focus, many institutions have or plan to create dedicated units for managing counterparty risk and related aspects. Such "CVA desks", as they are sometimes known, perform a key role for an organisation, centralising the management of all counterparty risk and ensuring that all new business is priced appropriately and competitively. *Chapter 12* tackles the important topic of how to manage counterparty risk within a financial institution considering responsibilities, organisational aspects, the mechanics of charging internal clients and the associated risk management of a firm's entire counterparty risk.

Chapter 13 explains in a historical context the concept of a default-remote or triple-A counterparty, a concept that has taken a number of guises, many of which are fundamentally flawed and may therefore in reality be nothing more than counterparty risk black holes. We describe derivative product companies (DPCs) that have had a long and successful existence and the more recent and specialised credit derivative product companies (CDPCs). We discuss in detail the monoline debacle that led to billions of dollars of losses for investment banks during the 2007–2008 period due to flawed assessment of triple-A credit quality.

For regulators, a perceived lack of transparency of OTC derivatives was a fundamental cause of the credit crisis. In 2009 the Obama Administration (through the US treasury) proposed a new framework for greater market regulation and oversight to the OTC derivatives market. One of the aims was to mandate centralised clearing of standardised CDS contracts. *Chapter 14* discusses central counterparties as a means of ultimately reducing counterparty risk within the financial markets and minimising the chance of future systemic risks and severe market disturbances. We try to give a balanced view of the positive and negative points of central clearing and define the situations in which it can have a beneficial impact on financial markets.

There has been much recent interest in counterparty risk and related aspects such as collateral management, credit value adjustments, wrong-way risk, credit default swaps and central clearing. In *Chapter 15* we consider briefly what the future might hold and put in context the current initiative aimed at controlling counterparty risk – the new challenge for global financial markets.

There are likely to be many changes and innovations in the counterparty risk area, please visit my website, *www.oftraining.com*, to check on up-to-date information on training courses, new initiatives and updates to the topics covered in this book.