

Course Outline

Credit Risk

Summer Term 2008

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Aims and Objectives

Fuelled in part by burgeoning growth in the credit derivatives market, the market in credit has expanded dramatically in the last 10 years. These increased activity levels have led to a much greater research focus on credit and one of the features of this work has been the high degree of complementarity between the research carried out by academics and by practitioners, for example, the investment banks and rating agencies. This was well illustrated in a major conference in 2005 organised by London Business School in conjunction with Moody's that attracted an audience of around 300 practitioners and academics.

The objective of the course is to provide an introduction as well as an in-depth understanding of issues in credit risk, its modelling and analysis and credit related instruments such as default-prone debt and credit derivatives. The objective is to provide a balance between developing, on one hand, a sound conceptual framework and, on the other, market understanding and insight. We regard both as essential to the informed practitioner.

Topics Covered

The topics covered in the course will include:

- Historical default experience
- Structural models of credit risk (Merton, Leland, Collin-Dufresne et. al.)
- Applications of structural models of credit risk to default prediction and hedging; the KMV model
- Historical recovery experience
- Default-intensity models (Iben-Litterman, Duffie-Singleton, etc.)
- Application of default intensity models to:
 - Credit default swaps (single-name corporate and sovereign)
 - Credit spread options
- Historical experience on correlated defaults
- Correlation modelling and applications
- Basket default products: index tranches and CDOs
- Institutional features and liquidity issues relevant to credit derivatives

Format and Teaching Methods

The classes will include discussions around empirical facts about credit, guest speakers on market developments, lectures on models and their applications, and also some cases.

The class has two sections. Both sections will meet weekly on Mondays, one from 9:00 to 12:15 and the other from 18:00 to 21:15.

Reading Materials

There are two quite recent and very good books that deal with the analysis of credit risk. While neither of them covers all the material we plan to discuss in the class, the

following one has a very good treatment of the two main modelling frameworks (the structural and intensity approaches) and we suggest that you may wish to buy it:

Lando, David, *Credit Risk Modelling: Theory and Applications*, Princeton: Princeton University Press, 2004. [Lando]

The other book, also excellent, is:

Duffie, Darrell and Kenneth Singleton, *Credit Risk*, Princeton: Princeton University Press, 2003. [DS]

Additional recommended reading materials (especially for a brief summary of credit risk modelling):

Chacko, Sjoman, Motohashi and Dessain (2006): *Credit Derivatives – A Primer on Credit Risk, Modeling, and Instruments*. [Chacko et. Al]

Dominic O’Kane and Lutz Schogl, *Modelling Credit: Theory and Practice*, Lehman Brothers International (Europe), 2001. [Lehman]

The Lehman Brothers Guide to Exotic Credit Derivatives, Lehman Brothers and Risk Waters Group, 2003. [RISK]

Binder

The final paper of this outline contains a list of the items that are included in the binder. Any remaining handouts, exercises, cases etc. will be either distributed in class or put on the Portal (or both).

Assignments and Assessment

The grade for the course will be based on a total of seven pieces of written work (four assignments and three cases – one each during Weeks 3 through 9 of the course) and a final exam (in-class in Week 10 of the course). The assignments, which may require extensive numerical computations (!), should be completed in groups of FOUR. You should email Yili (the course teaching assistant) with the composition of your group by 5pm on Friday 4 May.

All assignments must be handed in, in hard copy, to Yili before 9:00 am on the due date. Yili will be in her office on these days from 8:30 am.

The weights attached to each of these components are (HW = Homework):

		<i>Due Week</i>	<i>Weight</i>
1	Lucent Technologies (HW)	3	8%
2	KBC (A) Case	4	8%
3	Debt, Equity and Options (HW)	5	8%
4	Single Name Credit Derivatives (HW)	6	8%
5	Sovereign CDS Case	7	10%
6	Basket Products (HW)	8	8%
7	Structured Credit Index Products (Case)	9	10%
Exam	Final Exam	10	40%
	<i>Total</i>		<i>100%</i>

Summary Outline

Week	Topic
1 (21 April)	Overview of credit market and trends: Historical default experience, corporate finance issues (liquidity, strategic, technical defaults), abstraction from corporate finance issues Structural models I: Merton's model and extensions.
2 (28 April)	Structural models I: Merton's model and extensions, continued. Guest lecture: Joe Biernat, Head of Research, European Credit Management.
3 (5 May)	Assignment 1 Due – Lucent Structural models II : Leland's model and Moody's KMV Approach
4 (12 May)	Case 1 Due: Structural model application – KBC(A) Historical recovery or loss-given-default experience Relationship between spreads and expected loss
5 (19 May)	Assignment 2 Due – Debt, Equity and Options: The Leverage Effect Introduction to single-name credit derivatives Intensity modelling I : Litterman and Iben's reduced-form model
6 (26 May)	Assignment 3 Due – Single-name credit derivatives Intensity modelling II : Other reduced-form models Historical experience on correlation of defaults.
7 (2 June)	Case 2 Due: Sovereign CDS – The case of Argentina's Default Correlation: Products and modelling I Guest lecture: Moody's KMV (to be confirmed).
8 (9 June)	Assignment 4 Due – Basket products Correlation: Products and modelling II Relationship between equity, bond and credit derivative markets and Insider trading issues Implied correlation and liquidity effects
9 (16 June)	Case 3 Due: Structured Credit Index products Understanding the sub-prime crisis, SIVs, toxic waste... Guest lecture: Goldman Sachs (to be confirmed).
10 (23 June)	Final exam will be held in-class.

Week 1

Overview

21 April

Structural models I

Preparation

1. Chacko, Sjoman, Motohashi and Dessain (2006): *Credit Derivatives – A Primer on Credit Risk, Modeling, and Instruments* (Chapter 2)
2. RISK, Credit Derivative Products (up to Page 30).
3. Lando, Ch. 2, Corporate liabilities as Contingent Claims (Pages 7-17 very thoroughly and then read the rest skipping the equations if you can't follow them).

Topics

Overview of credit market and trends: Historical default experience, corporate finance issues (liquidity, strategic, technical defaults), abstraction from corporate finance issues

Week 2

Structural models I, continued.

28 April

Guest lecture: Joe Biernat, Head of Research, European Credit Management.

Preparation

1. Lando, Ch. 2, Corporate liabilities as Contingent Claims (Pages 7-17 very thoroughly and then read the rest skipping the equations if you can't follow them).
2. Huang and Huang, "How Much of Corporate-Treasury Yield Spread is Due to Credit Risk", Working Paper, Penn State University, 2003.
3. Leland, "Predictions of Default Probabilities in Structural Models of Debt", *Journal of Investment Management*, Volume 2, No. 2, 2004.

Topics

Equity as call; risky debt as riskless debt minus put; Merton; discussion of limitations of Merton; Exogenous default boundaries; first hitting time values.

Week 3

Structural models II

Moody's KMV Approach

5 May

Preparation

1. Lando Ch. 3, "Endogenous Default Boundaries and Optimal Capital Structure".
2. Lehman Brothers Fixed Income Quantitative Credit Research, *Hedging Debt with Equity*, November 2003.

Topics Leland type models; predictions of Leland model; Measuring asset volatilities; KMV; CreditGrades model

Week 4 **Case: KBC(A)**
Introduction to reduced-form models

12 May

- Preparation**
1. Viral Acharya, Sreedhar Bharath and Anand Srinivasan, "Does Industry-wide Distress Affect Defaulted Firms? Evidence from Creditor Recoveries", *Journal of Financial Economics*, 85(3), 2007, 787-821.
 2. Sergei Davydenko and Julian Franks, "Do Bankruptcy Codes Matter? A Study of Defaults in France, Germany, and the UK", forthcoming, *Journal of Finance*.

Topics Application of structural models
Historical recovery or loss-given-default experience
Relationship between spreads and expected loss

Week 5 **Intensity modelling I**

19 May

- Preparation**
1. Lando, Ch. 8, "Credit Default Swaps, CDOs and Related Products" (up to Section 8.5, inclusive)
 2. Darrell Duffie, "Credit Swap Valuation", *Financial Analysts Journal*, Jan-Feb 1999, pp. 73-85.
 3. Nashikkar, Amrut and Lasse Pedersen, "Corporate Bond Specialness", Working Paper, Stern School of Business, New York University.
 4. Litterman, Robert and Thomas Iben (1991): "Corporate Bond Valuation and the Term Structure of Credit Spreads", *The Journal of Portfolio Management*, Spring, pp. 52-64.
 5. [OPTIONAL] Fischer Black, Emanuel Derman and William Toy "A One-Factor Model of Interest Rates and Its Application to Treasury Bond Options", *Financial Analysts Journal*, Jan-Feb 1990, pp.33-39
 6. [OPTIONAL] JP Morgan European Credit Research, "Trading Credit Curves I", 21 March 2006.

Topics Litterman and Iben's reduced-form model
Pricing of single-name credit derivatives

Week 6 Intensity modelling II

26 May Default Correlation I

Preparation

1. [OPTIONAL] Lando, Ch. 5, "Intensity Modelling" (but it's really quite technical).
2. DS, Ch. 10, "Correlated Defaults".

Topics Other reduced-form models; Sovereign credit derivatives

Week 7 Default Correlation I, contd.

2 June

Case: Sovereign CDS – The case of Argentina's Default

Guest lecture: Moody's KMV (to be confirmed)

Preparation

1. Lando, Ch. 9, pp. 213-223 and skim the rest of the chapter.
2. RISK, Credit Derivative Products (up to Page 30).
3. RISK, Credit Derivatives Modelling (Pages 31-52).

Topics Historical experience on correlation of defaults, Introduction to correlation products, Introduction to correlation modelling

Week 8 Default Correlation II

9 June Information and liquidity issues

Preparation

1. Stanford University GSB case, F268, “Emergence of Default Swap Index Products”, 2004.
2. JP Morgan European Credit Research, “Introducing iTraxx Series 7”, 16 March 2007.
3. Viral Acharya and Timothy Johnson, “Insider Trading in Credit Derivatives”, *Journal of Financial Economics*, 84(1), 2007, 110-141.
4. Viral Acharya and Timothy Johnson, “More Insiders, More Insider Trading: Evidence from Private Equity Buyouts”, Working Paper, London Business School.
5. Tolk, Jeffrey S., “Understanding the Risks in Credit Default Swaps”, Moody’s Investors Service, 2001.
6. Viral Acharya, Stephen Schaefer and Yili Zhang, “Liquidity Risk and Correlation Risk: A Clinical Study of the General Motors and Ford Downgrade of May 2005”, Working paper, London Business School.
7. Francis A. Longstaff, Jun Pan, Lasse Heje Pedersen, and Kenneth J. Singleton, “How Sovereign is Sovereign Credit Risk?”, Working Paper, Stern School of Business, New York University.

Topics

Correlation modelling to price index products, Relationship between equity, bond and credit derivative markets, Implied correlation and liquidity effects

Week 9

16 June

Case: Structured Credit Index Products

Understanding the sub-prime crisis, SIVs, toxic waste...

Guest lecture: Klaus Toft, Managing Director, Goldman Sachs (to be confirmed).

Preparation

1. Seth Lubove and Daniel Taub, “The Sub-prime Sinkhole”, Bloomberg Markets, July 2007.
2. Viral Acharya, “The Sub-prime Smoke Shield: Is Credit Risk Transfer to Blame?” Insight Finance, London Business School
3. Seth Lubove and Daniel Taub, “Sub-prime Fiasco Exposes Manipulation by Mortgage Brokerages”.
4. Darrell Duffie, “Innovations on Credit Risk Transfer: Implications for Financial Stability”, Working Paper, Graduate School of Business, Stanford University.
5. Moody’s Investor Service, International Structure Finance, “Update on Moody’s Perspective on the Ongoing Liquidity Crisis and the Ratings of Debt Programmes in the SIV Sector”, 5 September 2007.

Topics Institutional framework for credit derivatives, Lessons from the sub-prime crisis

Week 10 Exam (in-class)

23 June

Preparation All material covered in the course

Topics All topics covered in the course

List of Materials Included in Binder.

1. Course Outline
2. Acharya, Viral, "Illustrations on the use of Bloomberg for applications to Options and Futures, Fixed Income and Credit Risk electives"
3. "Bloomberg tutorial for Credit Derivatives -- Credit Default Swap".
4. Dominic O'Kane and Lutz Schogl, *Modelling Credit: Theory and Practice*, Lehman Brothers International (Europe), 2001. [*Lehman*]
5. *The Lehman Brothers Guide to Exotic Credit Derivatives*, Lehman Brothers and Risk Waters Group, 2003. [*RISK*]
6. Chacko, Sjoman, Motohashi and Dessain (2006), *Credit Derivatives – A Primer on Credit Risk, Modelling, and Instruments* (Chapter 2).
7. Lucent Technologies, Inc (Case), Rajiv Guha & Stephen Schaefer, London Business School.
8. Huang and Huang, "How Much of Corporate-Treasury Yield Spread is Due to Credit Risk", Working Paper, Penn State University, 2003.
9. Leland, "Predictions of Default Probabilities in Structural Models of Debt", *Journal of Investment Management*, Volume 2, No. 2, 2004.
10. Lehman Brothers Fixed Income Quantitative Credit Research, Hedging Debt with Equity, November 2003.
11. Viral Acharya, Sreedhar Bharath and Anand Srinivasan, "Does Industry-wide Distress Affect Defaulted Firms? Evidence from Creditor Recoveries", *Journal of Financial Economics*, Volume 85, No. 3, 2007, page 787-821.
12. INSEAD case, 104-101-1, "KBC Alternative Investment Management (A): Convertible Bond Arbitrage".
13. Sergei Davydenko and Julian Franks, "Do Bankruptcy Codes Matter? A Study of Defaults in France, Germany, and the UK", forthcoming, *Journal of Finance*.
14. Darrell Duffie, "Credit Swap Valuation", *Financial Analysts Journal*, Jan-Feb 1999, pp. 73-85.
15. Litterman, Robert and Thomas Iben (1991): "Corporate Bond Valuation and the Term Structure of Credit Spreads", *The Journal of Portfolio Management*, Spring, pp. 52-64.
16. Amrut Nashikkar and Lasse Heje Pedersen, "Corporate Bond Specialness", Working Paper, Stern School of Business, New York University.
17. Fischer Black, Emanuel Derman and William Toy "A One-Factor Model of Interest Rates and Its Application to Treasury Bond Options", *Financial Analysts Journal*, Jan-Feb 1990, pp.33-39
18. JP Morgan European Credit Research, "Trading Credit Curves I", 21 March 2006.
19. Duffie, Darrell and Kenneth Singleton, "Correlated Defaults", Chapter 10 in: *Credit Risk*, Princeton: Princeton University Press, 2003.
20. Stanford University GSB case, F268, "Emergence of Default Swap Index Products", 2004. (Permission from Harvard Business School Publishing).
21. JP Morgan European Credit Research, "Introducing iTraxx Series 7", 16 March 2007.
22. Viral Acharya and Timothy Johnson, "Insider Trading in Credit Derivatives", forthcoming, *Journal of Financial Economics*, 84(1), 2007, 110-141.
23. Viral Acharya and Timothy Johnson, "More Insiders, More Insider Trading: Evidence from Private Equity Buyouts", Working Paper, London Business School.

24. Viral Acharya, Stephen Schaefer and Yili Zhang, "Liquidity Risk and Correlation Risk: A Clinical Study of the General Motors and Ford Downgrade of May 2005", Working paper, London Business School.
25. Tolk, Jeffrey S., "Understanding the Risks in Credit Default Swaps", Moody's Investors Service, 2001.
26. Francis Longstaff, Jun Pan, Lasse Pedersen and Kenneth Singleton, "How Sovereign is Sovereign Credit Risk?" Working paper, National Bureau of Economic Research.
27. Seth Lubove and Daniel Taub, "The Sub-prime Sinkhole", Bloomberg Markets, July 2007.
28. Viral Acharya, "The Sub-prime Smoke Shield: Is Credit Risk Transfer to Blame?" Insight Finance, London Business School
29. Seth Lubove and Daniel Taub, "Sub-prime Fiasco Exposes Manipulation by Mortgage Brokerages".
30. Darrell Duffie, "Innovations on Credit Risk Transfer: Implications for Financial Stability", Working Paper, Graduate School of Business, Stanford University.
31. Moody's Investor Service, International Structure Finance, "Update on Moody's Perspective on the Ongoing Liquidity Crisis and the Ratings of Debt Programmes in the SIV Sector", 5 September 2007.