Course Outline

Credit Risk
Summer Term 2008

Contact information:

Viral Acharya
Room: Plowden 231
Phone: (0) 20 7000 8255 (extn. 8255)
e-mail: vacharya@london.edu

Stephen Schaefer*
Room: Plowden 215
Phone: (0) 20 7000 8267 (extn. 8267)
e-mail: sschaefer@london.edu

*Assistant: Elmaret Peters
Room: Plowden 202
Phone: (0) 20 7000-8205 (extn. 8205)
e-mail: epeters@london.edu

Teaching Assistant:

Yili Zhang
Room: Plowden 201
Phone: (0) 20 7000 8248 (extn. 8248)
e-mail: yzhang.phd2005@london.edu
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:


The other book, also excellent, is:


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]


*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):

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Due Week</th>
<th>Weight</th>
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<tbody>
<tr>
<td>1 Lucent Technologies (HW)</td>
<td>3</td>
<td>8%</td>
</tr>
<tr>
<td>2 KBC (A) Case</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>3 Debt, Equity and Options (HW)</td>
<td>5</td>
<td>8%</td>
</tr>
<tr>
<td>4 Single Name Credit Derivatives (HW)</td>
<td>6</td>
<td>8%</td>
</tr>
<tr>
<td>5 Sovereign CDS Case</td>
<td>7</td>
<td>10%</td>
</tr>
<tr>
<td>6 Basket Products (HW)</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td>7 Structured Credit Index Products (Case)</td>
<td>9</td>
<td>10%</td>
</tr>
<tr>
<td>Exam</td>
<td>10</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>100%</strong></td>
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## Summary Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>Structural models I: Merton’s model and extensions, continued. Guest lecture: Joe Biernat, Head of Research, European Credit Management.</td>
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<tr>
<td>3</td>
<td>Assignment 1 Due – Lucent Structural models II : Leland’s model and Moody’s KMV Approach</td>
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<tr>
<td>4</td>
<td>Case 1 Due: Structural model application – KBC(A) Historical recovery or loss-given-default experience Relationship between spreads and expected loss</td>
</tr>
<tr>
<td>5</td>
<td>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</td>
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<tr>
<td>6</td>
<td>Assignment 3 Due – Single-name credit derivatives Intensity modelling II : Other reduced-form models Historical experience on correlation of defaults.</td>
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<tr>
<td>7</td>
<td>Case 2 Due: Sovereign CDS – The case of Argentina’s Default Correlation: Products and modelling I Guest lecture: Moody’s KMV (to be confirmed).</td>
</tr>
<tr>
<td>8</td>
<td>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</td>
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<tr>
<td>9</td>
<td>Case 3 Due: Structured Credit Index products Understanding the sub-prime crisis, SIVs, toxic waste… Guest lecture: Goldman Sachs (to be confirmed).</td>
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<tr>
<td>10</td>
<td>Final exam will be held in-class.</td>
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**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

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**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).


**Topics**

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

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**Week 3**

**Structural models II**

**Moody’s KMV Approach**

**5 May**

**Preparation**

1. Lando Ch. 3, “Endogenous Default Boundaries and Optimal Capital Structure”.

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

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)
| Topics | Litterman and Iben’s reduced-form model  
Pricing of single-name credit derivatives |
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<tbody>
<tr>
<td><strong>Week 6</strong></td>
<td><strong>Intensity modelling II</strong></td>
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<tr>
<td>26 May</td>
<td><strong>Default Correlation I</strong></td>
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</tbody>
</table>
| **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


Topics

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

Week 9

Case: Structured Credit Index Products
Understanding the sub-prime crisis, SIVs, toxic waste…

16 June

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

Preparation

<table>
<thead>
<tr>
<th>Topics</th>
<th>Institutional framework for credit derivatives, Lessons from the sub-prime crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week 10</strong></td>
<td><strong>Exam (in-class)</strong></td>
</tr>
<tr>
<td>23 June</td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td>All material covered in the course</td>
</tr>
<tr>
<td>Topics</td>
<td>All topics covered in the course</td>
</tr>
</tbody>
</table>
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”.
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).


29. Seth Lubove and Daniel Taub, “Sub-prime Fiasco Exposes Manipulation by Mortgage Brokerages”.
