Course Outline

Credit Risk

Spring 2011 – B40.3305 20 TuThu 1:30-2:50PM

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Aims and Objectives

Fuelled in part by burgeoning growth in the credit derivatives market in the late 90’s, the market in credit expanded dramatically for 10 years till 2Q 2007. These increased activity levels 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.

As you know, the credit derivatives market was at the heart of the ongoing global financial and economic crisis, having contributed substantially to it by affecting lender incentives once loans were securitized, allowing banks to “game” regulatory capital requirements, and creating opacity due to their over-the-counter (rather than centralized or exchange-based) trading infrastructure. While the market for credit derivatives suffers at the current moment, a part of its underlying rationale in terms of risk transfer from banking sector to the rest of the economy remains robust. Securitization markets are nevertheless somewhat moribund. This market will perhaps never be as large as it was in 2Q 2007, but it will certainly continue to play a major role in the financial intermediation sector going forward, once the crisis abates.

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 of credit related instruments such as default-prone debt of credit derivatives. The objective is also to provide an understanding of how and why these products played such a critical role in the ongoing crisis. As with any derivatives model, the idea is to learn it well so that one knows when not to use it! Hence, the objective is to provide a balance between developing a sound conceptual framework, on the one hand, and market understanding and insight, especially with respect to liquidity effects that are often so important in markets from a practitioner’s standpoint, on the other. We regard both as essential to the informed practitioner and academic.

Given the important role played by credit derivatives in the crisis, the course will also devote substantial amount of time understanding this role. We will also understand the new financial sector reforms – most notably the Dodd-Frank Act – and their direct or indirect impact on credit derivatives and on credit markets in general, going forward. Finally, given the emerging risks in sovereign credit risk area, especially in the Eurozone, we will cover sovereign credit risk and derivatives as well.

Topics Covered
The topics covered in the course will include:

- Historical default experience
- Structural models of credit risk
- Applications of structural models of credit risk to default prediction and hedging; the KMV model
- The success of structural models in explaining credit spreads and corporate bond returns
- Liquidity risk of corporate bond returns
- Historical recovery experience
- Introduction to single-name credit derivatives (corporate, sovereign, municipality,…)
- Default-intensity or reduced-form models
- Application of default intensity models to:
  - Credit default swaps (single-name corporate and sovereign)
  - Credit spread options
- Basket default products: index tranches and CDOs
- Correlation modelling and applications
- Institutional features such as insider trading as relevant to credit derivatives
- Credit Crisis 2007-09 and the role played by credit derivatives in the crisis
- Implications of the proposed financial sector reforms for the credit derivatives market

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 will be held on Tuesdays and Thursdays from 1:30pm to 2:50pm.

Reading Materials

The only required book for the course is any one of the NYU-Stern contributions on the financial crisis as it makes an excellent reading for facts relating to the financial crisis, which anyone aspiring to learn about credit markets must know:


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


Additional recommended materials (for a brief summary of credit markets and 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 Blackboard (or both).

Assignments and Assessment

- The grade for the course will be based on:
  1) a total of five pieces of written work (three assignments and one case study) due in the weeks given below.
  2) an in-class mid-term exam in Week 8 of the course.
  3) an in-class final exam on Tuesday, May 10th, or Thursday, May 12th (one of the days will be confirmed over time) from 1:30pm to 3:30pm.

- The assignments, which may sometimes require extensive numerical computations, should be completed in groups of THREE. Independent work will not be graded.

- You should email the course teaching assistant with the composition of your group by 5pm on Tuesday, February 15th. Students who are not assigned to groups of three by February 15th, 5pm, will be grouped by the discretion of the teaching assistant.

- All assignments must be handed in hard copy, at beginning of the class in the week when they are due.

- The teaching assistant does not hold official office hours. However, any questions about the course can be emailed to oshachar@stern.nyu.edu and will be answered on a daily basis, only after 9pm. Please use “Credit Risk: Section 20” as the subject line.

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

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<thead>
<tr>
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<th>Due Week</th>
<th>Weight</th>
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## Summary Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>The role played by credit derivatives in the crisis of 2007-09 - I  &lt;br&gt; (1 February)  &lt;br&gt; The Dodd-Frank Act and proposed reforms to the financial sector</td>
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<td>2</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  &lt;br&gt; (8 February)</td>
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<td>3</td>
<td>Structural models II: Moody’s KMV Approach  &lt;br&gt; (15 February)  &lt;br&gt; Empirical performance of structural models</td>
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<td>4</td>
<td>Assignment 1 Due – Lucent  &lt;br&gt; (22 February)  &lt;br&gt; Liquidity risk of corporate bond returns  &lt;br&gt; Introduction to single-name credit derivatives and historical recovery or loss-given-default experience</td>
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<td>5</td>
<td>Guest Lecture: Application of structural models in practice  &lt;br&gt; (1 March)  &lt;br&gt; Intensity modelling I: Litterman and Iben’s reduced-form model</td>
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<td>6</td>
<td>Intensity modelling II: Litterman and Iben’s reduced-form model continued  &lt;br&gt; (8 March)</td>
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<td><strong>Mid-term break</strong></td>
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<td>7</td>
<td>Assignment 2 Due – Single-name credit derivatives  &lt;br&gt; (22 March)  &lt;br&gt; Sovereign Credit Risk  &lt;br&gt; Case study of Argentina’s default  &lt;br&gt; Review for mid-term exam</td>
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<td>8</td>
<td>Mid-term exam in-class (based on all material covered until the break)  &lt;br&gt; (29 March)  &lt;br&gt; Guest Lecture: “Big-bang” protocol and its impact on credit derivatives</td>
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<td>9</td>
<td>The Dodd-Frank Act and proposed reforms to derivatives markets  &lt;br&gt; (5 April)  &lt;br&gt; Study of General Motors and Ford Downgrade of May 2005</td>
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<td>10</td>
<td>Correlation: Products overview and modelling I  &lt;br&gt; (12 April)</td>
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<td>11</td>
<td>Assignment 3 Due – Basket products  &lt;br&gt; (19 April)  &lt;br&gt; Correlation: Products and modelling II</td>
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<td>12</td>
<td>Case 1 Due: Structured Credit Index products  &lt;br&gt; (26 April)  &lt;br&gt; Correlation: Products and modelling III</td>
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<td>Date</td>
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<td>13 (3 May)</td>
<td>Relationship between equity, bond and credit derivative markets and Insider trading issues</td>
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<td>Shadow banking and its reform: Government-sponsored enterprises (Fannie Mae, Freddie Mac), Repo Markets and Money-market funds</td>
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<td>Final Exam (10/12 May)</td>
<td><strong>Final exam in-class (based on all material covered in the course)</strong> (1:30pm – 3:30pm)</td>
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### Week 1
#### 1 February
**Overview of the course**

**Credit Derivatives and the Crisis of 2007-09 - I**

**The Dodd-Frank Act and proposed reforms of financial sector**

**Preparation**
1. AR, Prologue: A Bird’s Eye View
2. ACRW, Prologue: A Bird’s Eye View of the Dodd-Frank Act
3. AR, Chapters 1-3, 5, 10.
4. (Optional) AR, Chapter 4, 6.

**Topics**
The role played by credit derivatives in the crisis of 2007-09 – I

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### Week 2
#### 8 February
**Overview of credit markets and trends**

**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; equity as a call; risky debt as a riskless debt minus put; Merton model.

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### Week 3
#### 15 February
**Structural models II**

**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**
Discussion of limitations of Merton
Measuring asset volatilities
KMV model and its implementation
| **Week 4** | **22 February** | **Credit risk or liquidity risk?**  
**Preparation**  
**Introduction to single-name credit derivatives and recovery**  
**Topics**  
Liquidity risk of corporate bonds returns and credit spreads  
Historical recovery or loss-given-default experience  
Relationship between spreads and expected loss |
| **Week 5** | **1 March** | **Guest Lecture: Application of structural models in practice**  
**Preparation**  
**Intensity modelling I: Litterman - Iben’s reduced-form model**  
**Topics**  
Litterman and Iben’s reduced-form model |
| **Week 6** | **8 March** | **Intensity modelling II: Litterman-Iben’s model continued**  
**Preparation**  
1. Lando, Ch. 8, “Credit Default Swaps, CDOs and Related Products” (up to Section 8.5, inclusive).  
**Topics**  
Pricing of single-name corporate and sovereign credit derivatives |
| **Week 7** | **22 March** | **Sovereign Credit Risk**  
**Case Study of Argentina’s Default**  
**Review for mid-term exam**  
**Preparation**  
**Topics**  
Understanding the emerging credit risk of sovereigns in the Eurozone through market prices of sovereign CDS |
Week 8
29 March

In-class Mid-Term Exam

Guest Lecture: Big-bang” protocol and its impact on credit derivatives (Sivan Mahadevan, Morgan Stanley Research)

Preparation
2. AR, Chapter 11, (optional) 12.

Topics
The role played by counterparty risk and opacity of credit derivatives in the financial crisis of 2007-09

Week 9
5 April

The Dodd-Frank Act and proposed derivatives reforms

Study of General Motors and Ford Downgrade of May 2005

Preparation
1. ACRW, Chapter 13 – Regulation of over-the-counter (OTC) derivatives.

Topics
Centralized clearing of derivatives and regulatory issues raised by remaining over-the-counter derivatives and creation of clearinghouses
Role of liquidity risk in giving rise to excess co-movement in credit markets: Analysis of CDS prices around the GM and Ford downgrade of May 2005

Weeks
10, 11
12 April, 19 April

Overview of Correlation Products

Default Correlation Modelling I and II

Preparation
1. RISK, Credit Derivative Products (up to Page 30).
4. Lando, Ch. 9, pp. 213-223 and skim the rest of the chapter.
5. RISK, Credit Derivatives Modelling (Pages 31-52).
6. DS, Ch. 10, “Correlated Defaults”.

Topics
Introduction to Basket and index credit derivatives
Introduction to Gaussian-copula based correlation modelling to price and hedge index products
**Week 12**

26 April

**Preparation**


**Topics**

Vasichek’s model to estimate loan loss portfolio distribution (based on Merton’s structural model of credit risk)

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**Week 13**

3 May

**Preparation**


3. ACRW, Chapters 10-12 (Money market funds, Repo markets, Hedge funds etc).

4. ACRW, Chapters 14-16 (GSEs, Rating agencies, Securitization).

**Topics**

Detecting information flows between equity and CDS markets

Understanding proposed reforms to shadow banking institutions

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**10/12 May (to be confirmed)**

**Final Exam (in-class), 1:30-3:30pm**

**Preparation**

All material covered in the course

**Topics**

All topics covered in the course
List of Materials Included in Binder

General

1. Course Outline
2. Acharya, Viral V., “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]

Week 1


Week 2

7. Chacko, Sjoman, Motohashi and Dessain (2006), Credit Derivatives – A Primer on Credit Risk, Modelling, and Instruments (Chapter 2).

Week 3


Week 4-5


Week 6


Week 7


Week 8

Week 9


Week 10-11


Week 12


Week 13