Single-name Credit Derivatives

Viral V. Acharya and Stephen M Schaefer
NYU-Stern and London Business School (LBS), and LBS

Credit Risk Elective
Spring 2009
Recent stress in credit default swaps

5-year senior unsecured CDS spread for Goldman Sachs and Morgan Stanley in September 2008
Source: Datastream
Recent stress in credit default swaps

The relative behavior of CDS spread and equity-implied CDS spread for Goldman Sachs during the sub-prime crisis; Source: Leland (2008)
Outline

• Types of single-name credit derivatives
• Credit default swaps (CDS)
Main Credit Derivative Products: \textbf{Single Name}

- \textit{single name credit default swap} is a contract that provides \textit{protection against a default event on the part of a single issuer ("name")}.
  - protection buyer pays premium and, in event of ‘credit event’, receives par in exchange for eligible obligation of “name”
Single Name Products, contd.

- *credit-linked note* – is a bond where the payment to the buyer is reduced in the event of default of the reference entity.
  - in essence the buyer is selling credit protection but in a “funded” way: by buying the bond (s)he puts up the compensation for default in advance.
Single Name Products, contd.

• *step-up bond* – the coupon paid is increased if the credit rating of the issuer falls to specified threshold
  
  ✓ European Telecoms industry: around 65 issues with over Euro 100 billion outstanding
  
  ✓ Deutsche Telekom and France Telecom – largest issuers
  
  ✓ **Example**: DT 5.75% Feb 12 2008 (Euro 1 billion) – coupon steps up 50 basis points (one-off) if rating falls to Baa2/BBB
Single Name Products, contd.

• **Total-rate-of-return swaps**:  
  ✓ pays difference between between total mark-to-market rate of return on  
  ➢ credit risky bond  
  ➢ and (e.g.) government bond  

• **Credit spread options**  
  ✓ gives right to trade bond at a given spread over reference yield such as Treasury yield or LIBOR
Credit Derivatives Product Mix

BBA Data to 2004:
2005-06: Index contracts grew rapidly

Source: British Bankers Association (BBA)
Who uses credit derivatives?

Buyers of Protection

- Banks: 52%
- Securities Firms: 21%
- Insurance Companies: 3%
- Corporates: 4%
- Mutual Funds: 2%
- Monoline / Reinsurers: 3%
- Hedge Funds: 12%
- Government: 2%

Sellers of Protection

- Securities Firms: 16%
- Pension Funds: 2%
- Insurance Companies: 12%
- Corporates: 2%
- Mutual Funds: 3%
- Monoline / Reinsurers: 21%
- Hedge Funds: 5%
- Banks: 39%

Source: British Bankers Association
How do Investors use Credit Derivatives?

• reduce (or increase)
  ✓ credit exposure
  ✓ credit concentrations (company, industry or country)

• customise exposure to particular credits or credit maturities

• take short positions in defaultable bonds (easier than in cash market)

• change distribution of credit quality:
  ✓ e.g., from portfolio of average credit quality bonds / loans to combination of higher credit quality and lower credit quality issues
Single Name Credit Default Swaps

• the **buyer** of protection pays
  ✓ a *constant premium per year* \((d)\) until the maturity of the contract **OR** the occurrence of the default event (whichever comes first)

• the **seller** pays
  ✓ if the *default event does occur*: the difference between the promised (face) value of the underlying issue \((100)\) and the market value of the defaulted bond \((Y)\)
  ✓ if the *default event does not occur*: zero
Credit Default Swap: Mechanics

- **Protection Buyer**
  - if **no default**: only cash flow is premium of $d$ b.p. p.a
  - if **default**: transaction stops and transaction settled either physically or in cash:
    - **physical**: buyer delivers defaulted obligation to seller and seller delivers 100% of nominal to buyer. (Physical is market standard)
    - **cash**: Mechanism to establish (“final price”) and seller delivers notional of transaction $x$ ($100 - \text{Final Price}$) to buyer
CDS: Critical Items in Contract

- **Reference entity**: company / country on which contract is written
- **Reference obligation**: identifies relevant seniority of claims (i.e., point in the capital structure)
- **Credit events**: describes what events can trigger default (see next page)
- **Obligation category**: describes what types of obligation can trigger default
- **Deliverable obligations**: describes what obligations can be delivered to the seller in settlement
The Default Event

- ISDA documentation (2003) defines **SIX** trigger events:
  1. bankruptcy
  2. obligation acceleration
  3. obligation default
  4. failure to pay
  5. repudiation / moratorium
  6. Restructuring

- In practice **THREE** principal credit events:
  1. bankruptcy
  2. failure to pay
  3. Restructuring

- The tough one is **restructuring**
Why is Restructuring Difficult?

- Restructuring is a “soft” credit event – loss to owner of reference securities is not always obvious
- Post restructuring debt will often have wide variety of maturities
  - Means that “cheapest-to-deliver” (CTD) option may be valuable
  - However … in bankruptcy or default debt is accelerated, outstanding debt becomes relatively homogeneous and CTD option has little value
Restructuring

• **Full Restructuring (FR):** under this option any restructuring is a credit event and any bond (with maturity up to 30 years) may be delivered
  ✓ Standard contract up to 1999

• **Example: Conseco Finance (Insurance):**
  ✓ Restructured to increase coupons – not disadvantageous to debt holders
  ✓ Some banks delivered long-dated, lower priced bonds and received par in return
  ✓ Seen as distortion to CDS market
Restructuring contd.

- **Modified Restructuring (MR):**
  - 2001 ISDA modified restructuring clause: limits opportunistic behaviour by protection buyers
  - limits deliverable obligations to bonds with maturity of less than 30 months after a restructuring.
  - has become common practice in North America in last few years

- **Modified Modified Restructuring (MMR):** “modified” version of the modified restructuring option
  - 2003 further modification of restructuring clause
  - resulted from criticism that modified restructuring was too strict with respect to deliverable obligations.
  - under the modified-modified restructuring – more popular in Europe – deliverable obligations with maturity of up to 60 months after a restructuring are allowed
Restructuring Contd.

• **No Restructuring (NR):** This option excludes restructuring altogether from the contract:
  - eliminates possibility that protection seller loses in “soft” credit event that does not necessarily result in losses to the protection buyer
  - August 2002: J P Morgan announces it would no longer include restructuring in some non-sovereign contracts
  - most popular CDS indices are traded under no-restructuring contract
Impact of Restructuring on Pricing

<table>
<thead>
<tr>
<th></th>
<th>Median Difference in Basis Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR – MR</td>
<td>1.7</td>
</tr>
<tr>
<td>MM – MR</td>
<td>0.7</td>
</tr>
<tr>
<td>FR – NR</td>
<td>4.6</td>
</tr>
<tr>
<td>MR – NR</td>
<td>2.6</td>
</tr>
</tbody>
</table>

*Source: Packer and Zhu, “Contractual Terms and CDS Pricing”, BIS Quarterly Review, March 2005*
Credit Default Swap Cash Flows

- Buyer of protection pays $d$ per period until default when he receives face value ($100$) minus market value of underlying note $100R$
Synthetic Credit Default Swap

**Default-free floating rate note (long)**

- Default-free floating rate: $L$
- $t=0$
- $t=\tau$ (default)

**Default-free floating rate note (short)**

- Defaultable floating rate: $L + S$

**Credit Default Swap**

- Defaultable floating rate note: $L + S$
- Payment in Default: $100R$
- Loss in default: $100(1-R)$
- Payment per period: $d$

- Even though time of default is unknown, value of default-free floater will equal 100 at each coupon date
## Pricing Default Swaps I: Supply (Dealer Perspective)

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Cash Flow Now</th>
<th>Cash Flow Period</th>
<th>Default Event Payment</th>
<th>Cash Flow at Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write default protection</td>
<td>0</td>
<td>d</td>
<td>-100(1-R)</td>
<td>0</td>
</tr>
<tr>
<td>Borrow bond and sell</td>
<td>100</td>
<td>-(L+S)</td>
<td>-R*100</td>
<td>-100</td>
</tr>
<tr>
<td>Invest Proceeds</td>
<td>-100</td>
<td>r</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>d - [S + (L-r)]</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

R: recovery rate; L: Libor rate; S: floating rate spread; r: repo rate; d: CDS rate

CDS rate (ask) = Spread + (Libor – repo rate) => d = S + (L – r)
### Pricing Default Swaps II: **Demand**
(Dealer/ Investor Perspective)

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Cash Flow</th>
<th>Default Event Payment</th>
<th>Cash Flow at Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transaction</strong></td>
<td><strong>Now</strong></td>
<td><strong>Period</strong></td>
<td></td>
</tr>
<tr>
<td>Buy default protection</td>
<td>0</td>
<td>-d</td>
<td>+100(1-R)</td>
</tr>
<tr>
<td>Buy bond</td>
<td>-100</td>
<td>+(L+S)</td>
<td>+R*100</td>
</tr>
<tr>
<td>Finance bonds</td>
<td>+100</td>
<td>-rₜₚ</td>
<td>-100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>-d + [ S + (L – rₜₚ )]</td>
<td>0</td>
</tr>
</tbody>
</table>

R: recovery rate; L: Libor rate; S: floating rate spread; rₜₚ: financing rate; d: CDS rate

**CDS rate (bid) = Spread - (financing – Libor) => d = S - (rₜₚ – L)**
CDS Pricing – Arbitrage Limits vs. Supply/Demand

Arbitrage Limits

\[ S + (L - \text{Repo}) \]

Demand/supply

\[ S \]

\[ S - (\text{financing} - L) \]

Market offer

Market bid

offer

bid
CDS Basis: may be positive or negative

\[
\text{CDS basis} = \text{CDS rate} - \text{Spread}
\]

\[
\begin{align*}
CDS &= S + \frac{L - \text{repo}}{L - r_B} \text{ ask} \\
\text{basis} &= CDS - S = \frac{L - \text{repo}}{L - r_B} \text{ ask}
\end{align*}
\]

Reasons for positive basis

• high demand for credit protection
• difficult / expensive to short bonds (repo rate low)
• funding below par
• cheapest-to-deliver option

Reasons for negative basis

• large supply of credit protection
• Financing rate above libor
• counterparty risk
## Average CDS Premia and Average Bond Spreads (US Corporates)

<table>
<thead>
<tr>
<th></th>
<th>Average CDS Premium</th>
<th>Average Bond-Swap Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA - AA</td>
<td>38</td>
<td>19</td>
</tr>
<tr>
<td>AAA - AA</td>
<td>66</td>
<td>60</td>
</tr>
<tr>
<td>BBB</td>
<td>160</td>
<td>172</td>
</tr>
<tr>
<td>BBB</td>
<td>475</td>
<td>495</td>
</tr>
<tr>
<td>B</td>
<td>1016</td>
<td>977</td>
</tr>
<tr>
<td>CCC</td>
<td>1944</td>
<td>1242</td>
</tr>
</tbody>
</table>

**Notes:**
1. Source - own calculations
2. Data: 5-year CDS premia;
3. Bond spreads to swaps
4. 500 issuers; 18,000 observations
# The Average CDS Basis: Jan 01 – June 02

<table>
<thead>
<tr>
<th></th>
<th>Average CDS Basis vs. Swap Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOL</td>
<td>13.0</td>
</tr>
<tr>
<td>Bank of America</td>
<td>-3.6</td>
</tr>
<tr>
<td>Ford Motor Credit</td>
<td>2.6</td>
</tr>
<tr>
<td>Goldman Sachs</td>
<td>-3.8</td>
</tr>
<tr>
<td>Daimler Chrysler</td>
<td>7.9</td>
</tr>
<tr>
<td>France Telecom</td>
<td>64.2</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>5.5</strong></td>
</tr>
</tbody>
</table>

Ford MC bonds relatively liquid: CDS basis was small
France Telecom bonds very difficult to borrow in 2002 – repo rate very low: CDS basis high and positive