

## Lecture 7 – Structured Finance (CDO, CLO, MBS, ABL, ABS)

There are several main types of structured finance instruments.

- Asset-backed securities (ABS) are bonds or notes based on pools of assets, or collateralized by the cash flows from a specified pool of underlying assets.
- Mortgage-backed securities (MBS) are asset-backed securities the cash flows of which are backed by the principal and interest payments of a set of mortgage loans.
  - Residential Mortgage-Backed Securities, (RMBS) deal with Residential homes, usually single family.
  - Commercial Mortgage-Backed Securities (CMBS) are for Commercial Real Estate such as malls or office complexes.
  - Collateralized mortgage obligations (CMOs) are securitizations of mortgage-backed securities.
- Collateralized debt obligations (CDOs) consolidate a group of fixed income assets such as high-yield debt or asset-backed securities into a pool, which is then divided into various tranches.
  - Collateralized bond obligations (CBOs) are CDOs backed primarily by corporate bonds.
  - Collateralized loan obligations (CLOs) are CDOs backed primarily by leveraged bank loans.
  - Commercial real estate collateralized debt obligations (CRE CDOs) are CDOs backed primarily by commercial real estate loans and bonds.

### Collateral Analysis

**Collateral** is assets provided to secure an obligation. Traditionally, banks might require corporate borrowers to commit company assets as security for loans. Today, this practice is called **secured lending** or **asset-based lending**. Collateral can take many forms: property, inventory, equipment, receivables, oil reserves, etc.

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|              | <b>Advance Rates (ABL Facility)</b> | <b>BV of Assets (\$ mm)</b> | <b>Debt Capacity based on Collateral</b> |
|--------------|-------------------------------------|-----------------------------|--|
| Cash         | 100%                                | 50.00                       | 50.00                                    |
| A/R          | 85%                                 | 200.00                      | 170.00                                   |
| Inventory    | 50%                                 | 150.00                      | 75.00                                    |
| Fixed Assets | 50%                                 | 300.00                      | 150.00                                   |
| Investments  | 50%                                 | 100.00                      | 50.00                                    |
| Total        |                                     | 800.00                      | 495.00                                   |

A more recent development is **collateralization arrangements** used to secure [repo](#), [securities lending](#) and [derivatives](#) transactions. Under such arrangement, a party who owes an obligation to another party posts collateral—typically consisting of cash or [securities](#)—to secure the obligation. In the event that the party defaults on the obligation, the secured party may seize the collateral. In this context, collateral is sometimes called **margin**.

An arrangement can be unilateral with just one party posting collateral. With two-sided obligations, such as a [swap](#) or foreign exchange [forward](#), bilateral collateralization may be used. In that situation, both parties may post collateral for the value of their total obligation to the other. Alternatively, the net obligation may be collateralized—at any point in time, the party who is the net obligator posts collateral for the value of the net obligation.

In a typical collateral arrangement, the secured obligation is periodically marked-to-market, and the collateral is adjusted to reflect changes in value. The securing party posts additional collateral when the [market value](#) has risen, or removes collateral when it has fallen. The collateral agreement should specify:

- **Acceptable collateral:** A secured party will usually prefer to receive highly rated collateral such as Treasuries or agencies. Collateral whose market

value is volatile or negatively correlated with the value of the secured obligation is generally undesirable.

- Frequency of margin calls: Because the value of an obligation and the value of posted collateral can change, a secured party typically wants to mark-to-market frequently, issuing a margin call to the securing party for additional collateral when needed.
- Haircuts: In determining the amount of collateral that must be posted, haircuts are applied to the market value of various types of collateral. For example, if a 1% haircut is applied to Treasuries, then Treasuries are valued at 99% of their market value. A 5% haircut might be applied to certain corporate bonds, etc.
- Threshold level: Only the value of an obligation above a certain threshold level may be collateralized. For example, if a USD 1MM threshold applies to a USD 5MM obligation, only USD 4MM of the obligation will actually be collateralized.
- Close-out and termination clauses: The parties must agree under what circumstances the obligation will be terminated. The form of a final settlement in the event of such termination and the role of the collateral in such settlement is specified.
- Valuation: A methodology for marking both the obligation and the collateral to market must be agreed upon.
- Rehypothecation rights: The secured party may wish to have use of posted collateral possibly lending it to another party or posting it as collateral for its own obligations to another party. Rehypothecation is not permitted in many jurisdictions.

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Legal treatment of collateral varies from one jurisdiction to another. In some jurisdictions, the secured party takes legal possession of collateral, but is legally bound by how the collateral may be used and the conditions upon which it must be returned. Such transfer of title provides the secured party a high degree of assurance that it may seize the collateral in the event of a default. Transfer of title, however, may be treated as a taxable event in some jurisdictions. In other jurisdictions, the securing party retains ownership of collateral, but the secured party acquires a [perfected](#) interest in it.

### **Portfolio Credit Risk – Technical Analysis:**

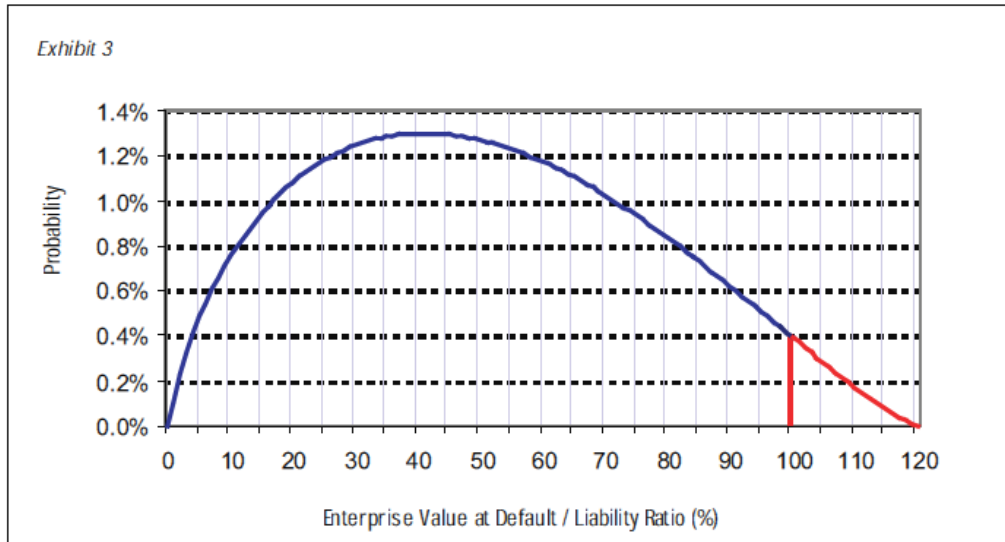
**Credit assessment** - institutions manage credit risk, calculate economic and regulatory capital, and manage their balance sheets more effectively. Major components of an internal rating system, includes tools and methodologies for the analysis of probability of default, loss given default, and exposure at default.

**Loss Given Default** or **LGD** is a common parameter in Risk Models and also a parameter used in the calculation of [Economic Capital](#) or [Regulatory Capital](#) under [Basel II](#) for a banking institution. This is an attribute of any exposure on bank's client. Exposure is the amount that one may lose in an investment.

|   |
|---|
| $\text{LGD} = \text{Default} * (1 - \text{Recovery})$ |
|---|

**Basel Accord:** The New Basel Accord, expected to be implemented at year-end 2006, will require internationally active banks to use more risk sensitive methods for calculating credit risk capital requirements

**Default** measure is derived from an annualized expected default rate. By definition, a debt instrument can experience a loss only if there has been a default. However, there is no standard definition of what constitutes a default. Different definitions may be used for different purposes. Typically a default occurs when any of the following conditions are met:



- A loan is placed on non-accrual
- A charge-off has already occurred
- The obligor is more than 90 days past due
- The obligor has filed bankruptcy

The BIS reference definition of default for purposes of the New Basel Accord reflects many of these events:

“A default is considered to have occurred with regard to a particular obligor when one or more of the following events has taken place.

- (a) It is determined that the obligor is unlikely to pay its debt obligations (principal, interest, or fees) in full;
- (b) A credit loss event associated with any obligation of the obligor, such as charge-off, specific provision, or distressed restructuring involving the forgiveness or postponement of principal, interest, or fees;
- (c) The obligor is past due more than 90 days on any credit obligation; or

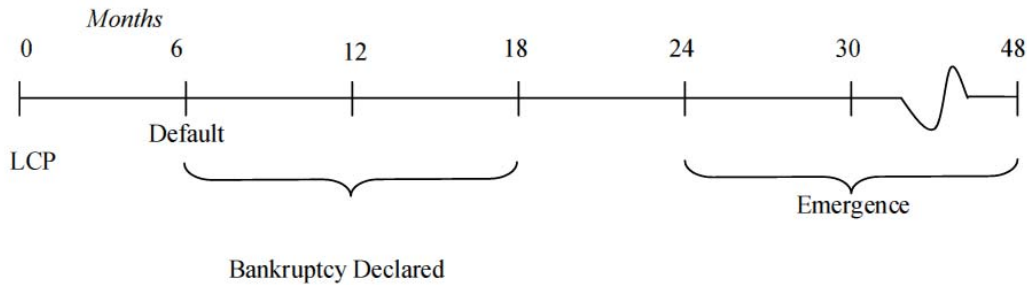
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(d) The obligor has filed for bankruptcy or similar protection from creditors.”

## Timeline of a distress firm:



A firm in distress typically goes through four stages as is illustrated in the timeline above.

1. **LCP**: the last cash paid date is known only ex post but serves as an anchor to the chronology.

2. **Default** is considered to occur at some later point, for bonds typically six months later. Default is often defined when a coupon or interest payment is missed. The six month delay between last cash paid and default results from coupons on bonds typically being paid twice yearly.

3. **Bankruptcy** (usually Chapter 11) is declared anywhere from the time of default to about a year later. A firm can default on debt obligations and still not declare bankruptcy depending on the negotiations with its creditors.

4. **Emergence** from bankruptcy proceedings, either via liquidation or genuine emergence as a going concern, typically occurs anywhere from two to four years after the last cash paid. Cash flows from distressed instruments may occur throughout this process, although the bulk

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comes during or immediately after emergence when restructuring plans and additional financing (e.g. debtor-in-possession lending) are in place.

The time spent in bankruptcy can dramatically reduce the value of debt recovery. The average time spent in bankruptcy is around two years (Helwege (1999), Eberhart, Altman and Aggarwal (1998), Gupton, Gates and Carty (2000), Garbade (2001)) which is reflected in our timeline. Bond-only studies indicate that the average time in bankruptcy is a bit longer, more like 2½ years (Wagner (1996), Eberhart and Sweeny (1992)). Helwege (1999) finds that the presence of contingent claims (e.g. unfunded pension liabilities) and size (a proxy for complexity) tend to lengthen bankruptcy proceedings.

## Altman's Z-SCORE

### Z Formula

$$Z = 1.2x(WC/TA) + 1.4x(RE/TA) + 3.3x(EBIT/TA) + 0.6x(MVE/Liabilities) + 0.99x(Sales/TA)$$

WC = Working Capital  
TA=Total Assets  
RE=Retained Earnings  
MVE=Market Value of Equity

| <u>Z-Score</u>    | <u>Bankruptcy</u> |
|-------------------|-------------------|
| 1.8x or less      | Likely            |
| Between 1.8 - 3.0 | Uncertain         |
| 3.0 or above      | Not likely        |

## Recovery

Historical 70% Corporate Loans, 45% for Bonds

**Volatility measure** is derived from the standard deviation of that expected default rate.

**Correlation measure** is a ratio of this standard deviation with and without the correlation

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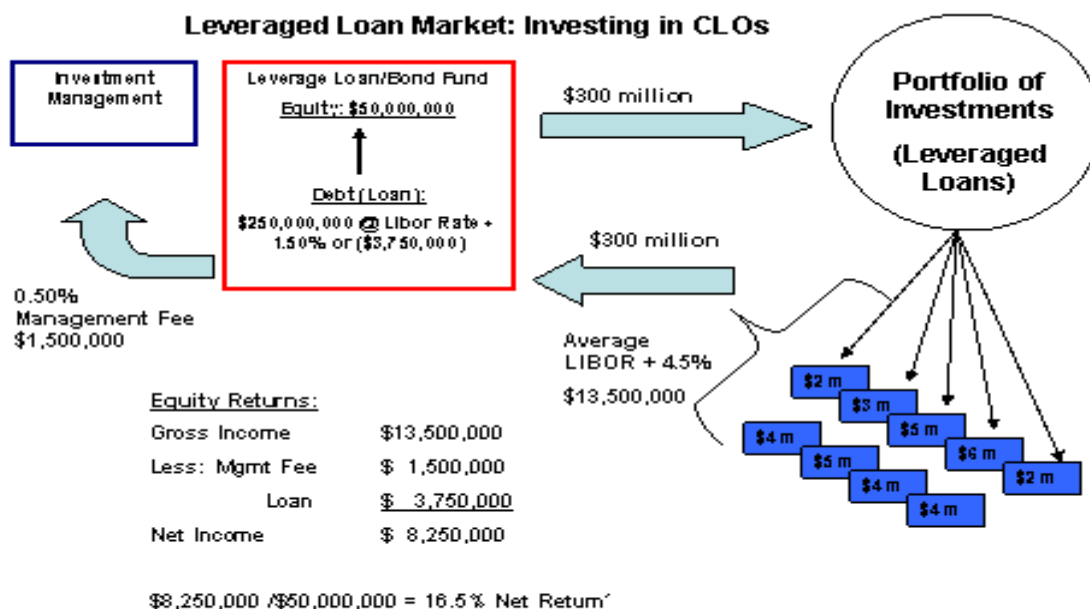
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coefficient factored in.

**RAROC** (Return Adjusted Risk of Capital):



**CLO STRUCTURE**



<sup>\*</sup> Non adjusted for defaults – Assuming 3% default with 70% Recovery, IRRs are estimated at 11.1%

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## Arbitrage Cash Flow CLO Model

### Capital Structure

| Tranche    | Par amount   | % Cap         | % Debt | Rating S&P/M | Discount |        | Price   | WACD         |
|------------|--------------|---------------|--------|--------------|----------|--------|---------|--------------|
|            |              |               |        |              | margin   | Coupon |         |              |
| A          | 429.0        | 64.4%         | 71.2%  | AAA/Aaa      | 120      | L+120  | 99.7695 | 85.41        |
| B          | 61.8         | 9.3%          | 10.2%  | AA/Aa2       | 185      | L+185  | 97.3653 | 18.95        |
| C          | 53.5         | 8.0%          | 8.9%   | A/A2         | 285      | L+285  | 94.8608 | 25.30        |
| D          | 32.5         | 4.9%          | 5.4%   | BBB/Baa2     | 375      | L+375  | 90.0358 | 20.22        |
| E          | 26.0         | 3.9%          | 4.3%   | BB/Ba2       | 420      | L+420  | 93.9848 | 18.12        |
| Total Debt | 602.8        | 90.5%         | 100.0% |              |          |        |         |              |
| Equity     | 63.5         | 9.5%          |        | NR           |          |        |         |              |
|            | <u>666.3</u> | <u>100.0%</u> |        |              |          |        |         | <u>168.0</u> |

### Portfolio of Leveraged Loans

|            | Par amount   | % Cap         | Rating S&P | Discount margin | Annual Income     | WAI           |
|------------|--------------|---------------|------------|-----------------|-------------------|---------------|
|            |              |               |            |                 |                   |               |
| Company 1  | 21.0         | 3.2%          | B+         | 350             | 735,000           | 11.03         |
| Company 2  | 35.0         | 5.3%          | B-         | 500             | 1,750,000         | 26.27         |
| Company 3  | 25.0         | 3.8%          | B          | 450             | 1,125,000         | 16.89         |
| Company 4  | 22.0         | 3.3%          | B+         | 375             | 825,000           | 12.38         |
| Company 5  | 30.0         | 4.5%          | B+         | 375             | 1,125,000         | 16.89         |
| Company 6  | 15.0         | 2.3%          | BB-        | 325             | 487,500           | 7.32          |
| Company 7  | 15.0         | 2.3%          | B+         | 375             | 562,500           | 8.44          |
| Company 8  | 25.0         | 3.8%          | B          | 425             | 1,062,500         | 15.95         |
| Company 9  | 19.3         | 2.9%          | B-         | 550             | 1,058,750         | 15.89         |
| Company 10 | 25.0         | 3.8%          | CCC        | 750             | 1,875,000         | 28.14         |
| Company 11 | 30.0         | 4.5%          | B+         | 375             | 1,125,000         | 16.89         |
| Company 12 | 25.0         | 3.8%          | B-         | 600             | 1,500,000         | 22.51         |
| Company 13 | 30.0         | 4.5%          | B          | 475             | 1,425,000         | 21.39         |
| Company 14 | 15.0         | 2.3%          | B+         | 425             | 637,500           | 9.57          |
| Company 15 | 30.0         | 4.5%          | B+         | 350             | 1,050,000         | 15.76         |
| Company 16 | 32.0         | 4.8%          | BB         | 300             | 960,000           | 14.41         |
| Company 17 | 27.0         | 4.1%          | B+         | 375             | 1,012,500         | 15.20         |
| Company 18 | 30.0         | 4.5%          | B-         | 500             | 1,500,000         | 22.51         |
| Company 19 | 28.0         | 4.2%          | B-         | 501             | 1,402,800         | 21.06         |
| Company 20 | 35.0         | 5.3%          | B-         | 502             | 1,757,000         | 26.37         |
| Company 21 | 30.0         | 4.5%          | B-         | 503             | 1,509,000         | 22.65         |
| Company 22 | 25.0         | 3.8%          | B-         | 504             | 1,260,000         | 18.91         |
| Company 23 | 30.0         | 4.5%          | B-         | 505             | 1,515,000         | 22.74         |
| Company 24 | 32.0         | 4.8%          | B-         | 506             | 1,619,200         | 24.30         |
| Company 25 | 35.0         | 5.3%          | B-         | 507             | 1,774,500         | 26.63         |
|            | <u>666.3</u> | <u>100.0%</u> |            |                 | <u>30,653,750</u> | <u>460.09</u> |

|                  | Par    |        | Annual Debt Svc   |
|------------------|--------|--------|-------------------|
|                  | amount | Margin |                   |
| A                | 429.0  | 120.00 | 5,148,000         |
| B                | 61.8   | 185.00 | 1,142,375         |
| C                | 53.5   | 285.00 | 1,524,750         |
| D                | 32.5   | 375.00 | 1,218,750         |
| E                | 26.0   | 420.00 | 1,092,000         |
|                  |        |        | <u>10,125,875</u> |
| Equity CF        |        |        | 20,527,875        |
| ROE              |        |        | 32.3%             |
| <b>BASE CASE</b> |        |        |                   |
| Default Rate     |        |        | 3.00%             |
| Recovery         |        |        | 70.00%            |
| LGD rate         |        |        | 0.900%            |
| LGD              |        |        | <u>5,996,250</u>  |
| RAROC            |        |        | 14,531,625        |
| RAROC %          |        |        | 22.88%            |