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Price and risks of CDO

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CDO

type of structured asset-backed security (ABS)

5 INVESTMENT BANKS:

- GOLDMAN SACHS
- MORGAN STANLEY
- LENMAN BROTHERS
- MERRILL LYNCH
- BEAR STEARNS

2 FINANCIAL CONGLOMARATES:

- CITIGROUP
- JP MPRGAN

3 RATING AGENCIES:

- MOODY’S
- STANDARD & POOR’S
- FITCH

3 SECURITY INSURANCE COMPANY :

- AIG
- MBIA
- AMBAC

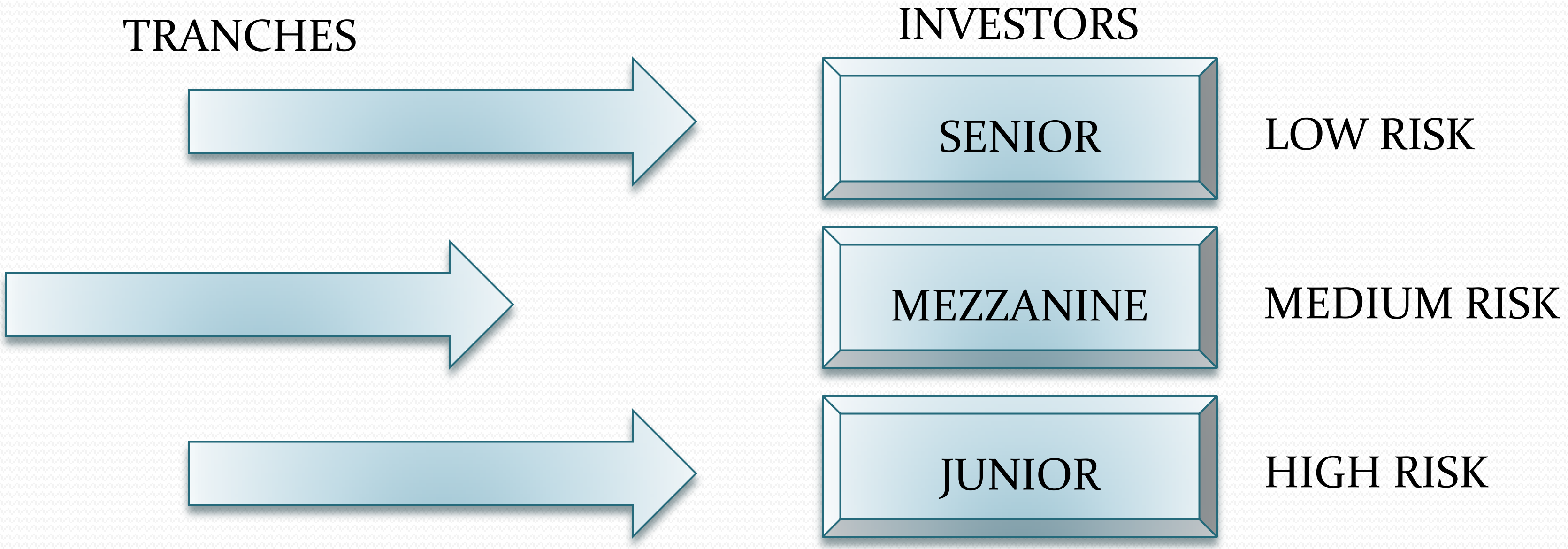
HOME BUYERS

LENDERS

INVESTMENT BANKS

RATING AGENCIES

INVESTORS



1987 – THE FIRST CDO

2000-2006 – THE FASTEST GROWING SECTOR

According to the Securities Industry and Financial Markets Association, the global issuance of CDOs rose from $157 billion to $503 billion between 2004 and 2007.

Global investors began to stop funding CDOs in 2007. contributing to the collapse 0f certain structured investments held by major investment banks and the bankruptcy of several subprime lenders.

Q – pricing measure
t – time horizon

default indicator – the standard one factor Gaussian copula model

$$V_i = \sqrt{p}V + \sqrt{1-p}\overline{V_i}$$

τ – default date
P – default probability

$$\tau_i \leq t \iff V_i \leq \Phi^{-1}(P_i)$$

$$1_{\{\tau_i \leq t\}} = 1_{\{V_i \leq \Phi^{-1}(P_i)\}}$$

p – tetrachoric correlation coefficient as opposed to the linear correlation of default indicators

$$Q(\tau_i \leq t|V) = \Phi\left(\frac{\Phi^{-1}(P_i) - \sqrt{p}V}{\sqrt{1-p}}\right) = P_i(V)$$

since all **risks** associated with different names are usually **positively correlated**, an **increase in the variance** of an **individual risk** leads to an **increase in the variance** of the **portfolio loss**

R – recovery rate

$$\sum_{i=1}^{n}(1-R_i)1_{\{V_i \le \Phi^{-1}(P_i)\}} \le \sum_{i=1}^{n}(1-\bar{R}_i)1_{\{V_i \le \Phi^{-1}(\bar{P}_i)\}}$$

The portfolio loss before the markdown is less than the portfolio loss after markdown. In other words, a **markdown leads to an increase of risk of the credit portfolio**.

M – loss given default

$$M_i(V) = (1-R_{min}^i)\frac{\Phi\left(\frac{\Phi^{-1}(\bar{P}_i)-\sqrt{p}V}{\sqrt{1-p}}\right)}{\Phi\left(\frac{\Phi^{-1}(P_i)-\sqrt{p}V}{\sqrt{1-p}}\right)}$$

$$0 \le R_{min}^i \le R_i \le 1$$

$$\bar{P}_i\left(1-R_{min}^i\right) = P_i(1-R_i)$$

CDO tranches are sensitive to the business cycle

CDO tranches are sensitive to correlation + correlation of defaults is typically driven by the business cycle = correlation risk of CDO tranches can be characterized business cycle risk.

The **junior tranche**, in a first-loss position, expects to bear **defaults** of about half its notional amount in a trend **growth** macroeconomic scenario and expects to **lose** its entire notional amount in a **recession**.

The **mezzanine tranche**, in a second-loss position, suffers **no losses** in a **boom** and **minimal loss** in a trend **growth** scenario, but suffers **most** of the portfolio's expected **loss** in a **recession**. In this sense, mezzanine tranches are leveraged bets on business cycle risk.

The **senior tranche** expects to suffer very **little loss**, even in a recession scenario. While the senior tranche is not exposed to recession risk, it could be said to be exposed to depression risk.