Economics 435
The Financial System
(12/7/2021)

Lecture 25 Part 2

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UW Madison
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Outline

- Derivatives (background)
- Derivatives in the Financial Crisis

Financial Derivatives

- Financial derivatives have payoffs that are linked to previously issued securities, and *some* are extremely useful risk reduction tools.
- Financial derivatives will be useful when they properly reflect risks.
- If they do not, then reliance on them can lead to problems

See https://media.pearsoncmg.com/ph/bp/bp_mishkin_econmbfm_11/webchapters/Mishkin11_Ch04_Web.pdf

Hedging

To hedge is to engage in a financial transaction that reduces or eliminates risk. When a financial institution has bought an asset, it is said to have taken a long position, and this exposes the institution to risk if the returns on the asset are uncertain. Conversely, if it has sold an asset that it has agreed to deliver to another party at a future date, it is said to have taken a short position, and this can also expose the institution to risk. Financial derivatives can be used to reduce risk by invoking the following basic principle of hedging: **Hedging risk involves engaging in a financial transaction that offsets a long position by taking an additional short position, or offsets a short position by taking an additional long position.**

Types of Financial Derivatives

- Futures
- Options
- Swaps
- Other (in next section)

Types of Financial Futures

TABLE 1 Widely Traded Financial Futures Contracts in the United States

Type of Contract	Contract Size	Open Interest, August 2014
Interest-Rate Contracts		
Treasury bonds	$100,000	984,935
Treasury notes	$100,000	2,753,371
Five-year Treasury notes	$100,000	2,192,905
Two-year Treasury notes	$200,000	1,377,298
Thirty-day Fed funds rate	$5 million	544,115
Eurodollar	$4 million	12,988,737
Stock Index Contracts		
Standard & Poor's 500 Index	$250 × index	164,586
Standard & Poor's MIDCAP 400	$500 × index	835
NASDAQ 100	$100 × index	7,001
Nikkei 225 Stock Average	$5 × index	62,676
Currency Contracts		
Yen	12,500,000 yen	226,449
Euro	125,000 euros	413,159
Canadian dollar	100,000 Canadian $	110,965
British pound	100,000 pounds	234,219
Swiss franc	125,000 francs	57,511
Mexican peso	500,000 new pesos	147,059

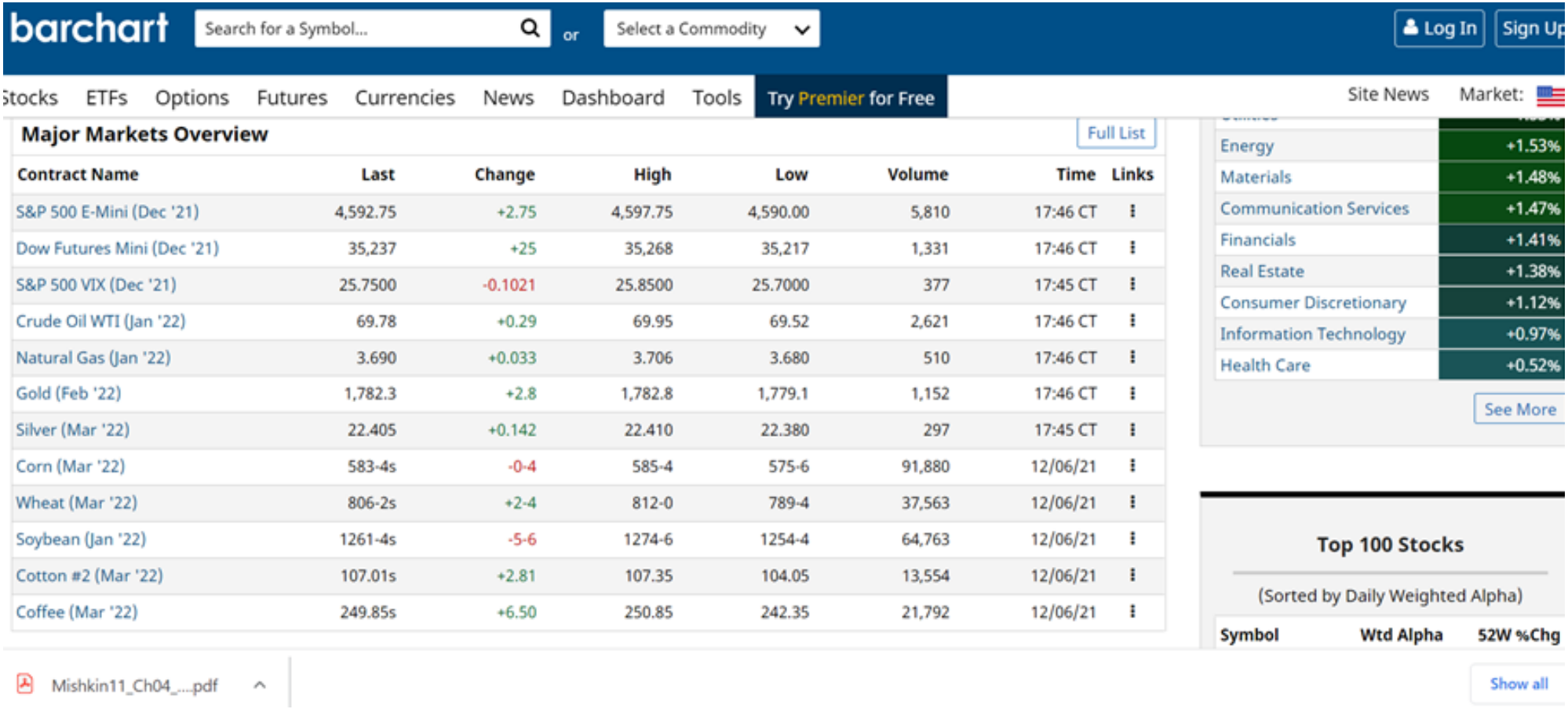
Source: *CME Group*: http://www.cmegroup.com/market-data/volume-open-interest; click on CME Group Open Interest Report.

Futures defined

- Best to explain by example:

“let’s consider what happens when you buy or sell a Treasury bond futures contract. Let’s say that on February 1, you sell one $100,000 June contract at a price of 115 (that is, $115,000). By selling this contract, you agree to deliver $100,000 face value of the long-term Treasury bonds to the contract’s counterparty at the end of June for $115,000.”

Other (Nonfinancial) Futures



Options

Options are contracts that give the purchaser the option, or right, to buy or sell the underlying financial instrument at a specified price, called the exercise price or strike price, within a specific period of time (the term to expiration). The seller (sometimes called the writer) of the option is obligated to buy or sell the financial instrument from or to the purchaser if the owner of the option exercises the right to sell or buy.

Options Definitions

- A call option is a contract that gives the owner the right to buy a financial instrument at the exercise price within a specific period of time. A put option is a contract that gives the owner the right to sell a financial instrument at the exercise price within a specific period of time.
- “American” can be exercised any time; “European” can only be exercised at maturity

Interest Rate Swaps

The most common type of interest-rate swap (called the plain vanilla swap) specifies (1) the interest rate on the payments that are being exchanged; (2) the type of interest payments (variable or fixed-rate); (3) the amount of notional principal, which is the amount on which the interest is being paid; and (4) the time period over which the exchanges will continue to be made.

Credit Default Swaps

Another form of credit swap is, for arcane reasons, called a credit default swap, although it functions more like insurance. With a credit default swap, one party that wants to hedge credit risk pays a fixed payment on a regular basis in return for a contingent payment that is triggered by a credit event, such as the bankruptcy of a particular firm or the downgrading of the firm's credit rating by a credit-rating agency.

Mortgage Backed Securities

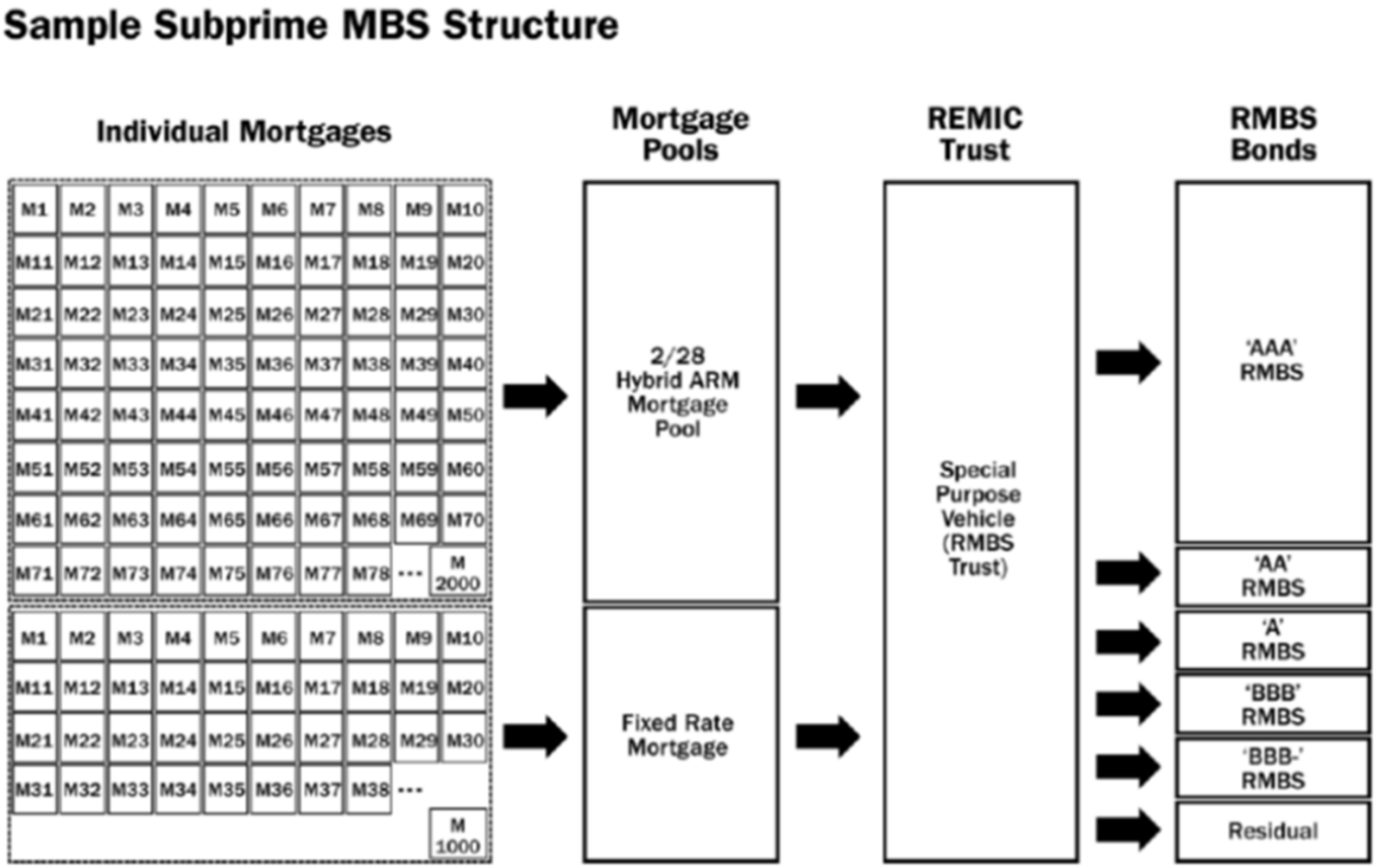
Mortgage-backed securities, called MBS, are bonds secured by home and other real estate loans. ... That pool is then sold to a federal government agency like Ginnie Mae or a government sponsored-enterprise (GSE) such as Fannie Mae or Freddie Mac, or to a securities firm to be used as the collateral for the new MBS.

See https://www.finra.org/investors/learn-to-invest/types-investments/bonds/types-of-bonds/mortgage-backed-securities

Derivatives in the Crisis

- Mortgage Backed Securities (MBS), a type of asset backed security (ABS)
- Collateralized Debt Obligations (CDO)
- Credit Default Swaps (covered before)
- Repackaging assets so as to create new assets is sometimes called structured finance

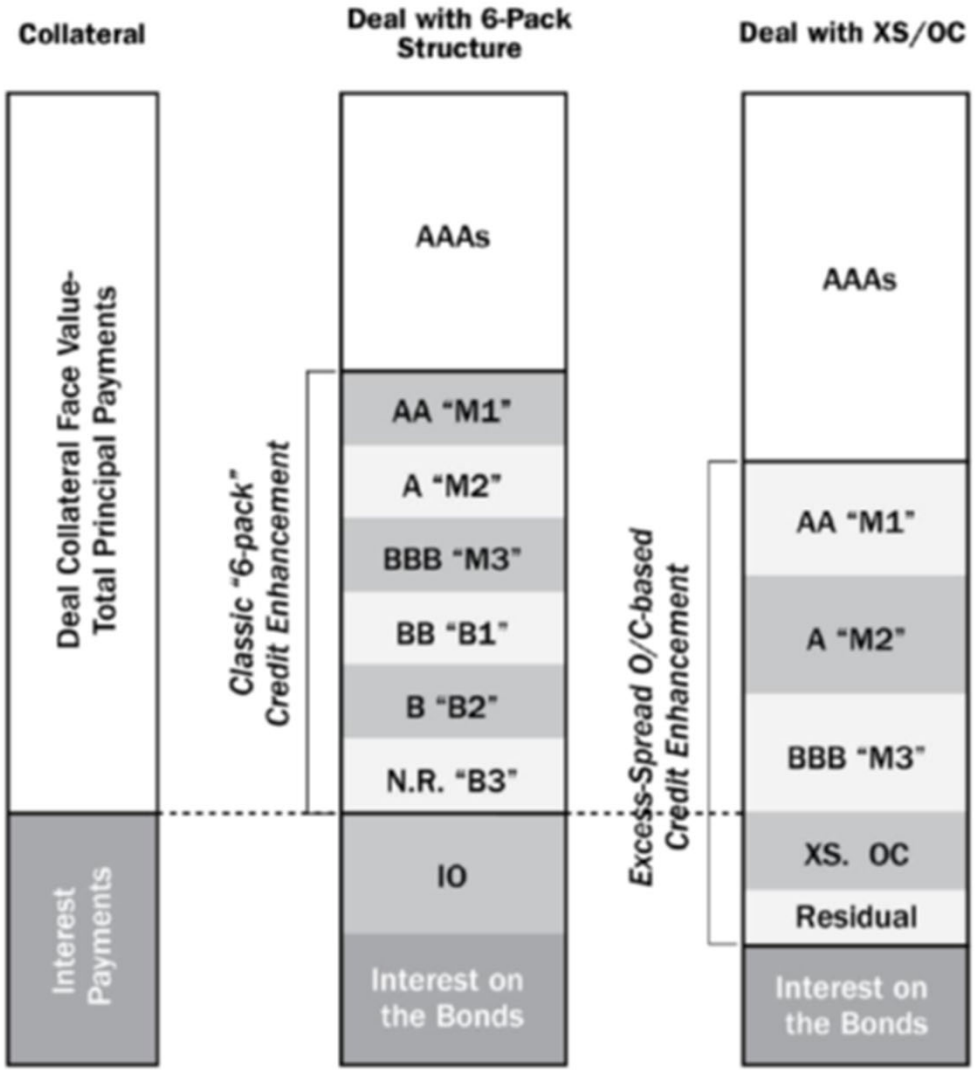
Mortgage Backed Security - Outline



Source: Kevin Kendra, Fitch, "Tranche ABX and Basis Risk in Subprime RMBS Structured Portfolios," Feb. 20, 2007.

MBS Structure

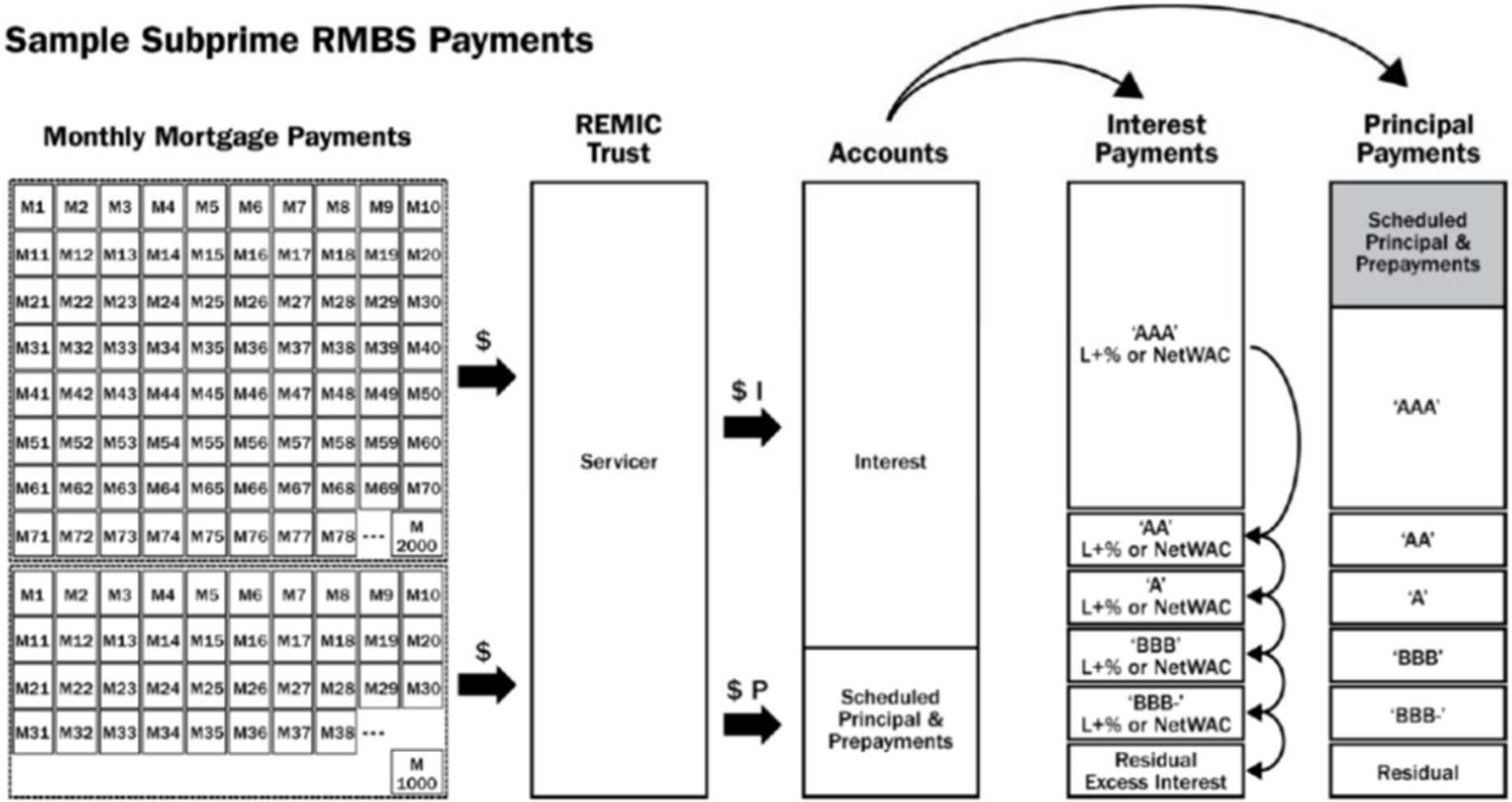
Senior/Sub 6-Pack Structure vs. the XS/OC Structure



Note: The scale in Figure 1 does not accurately reflect relative size of bonds, IO or interest flow. Source: UBS

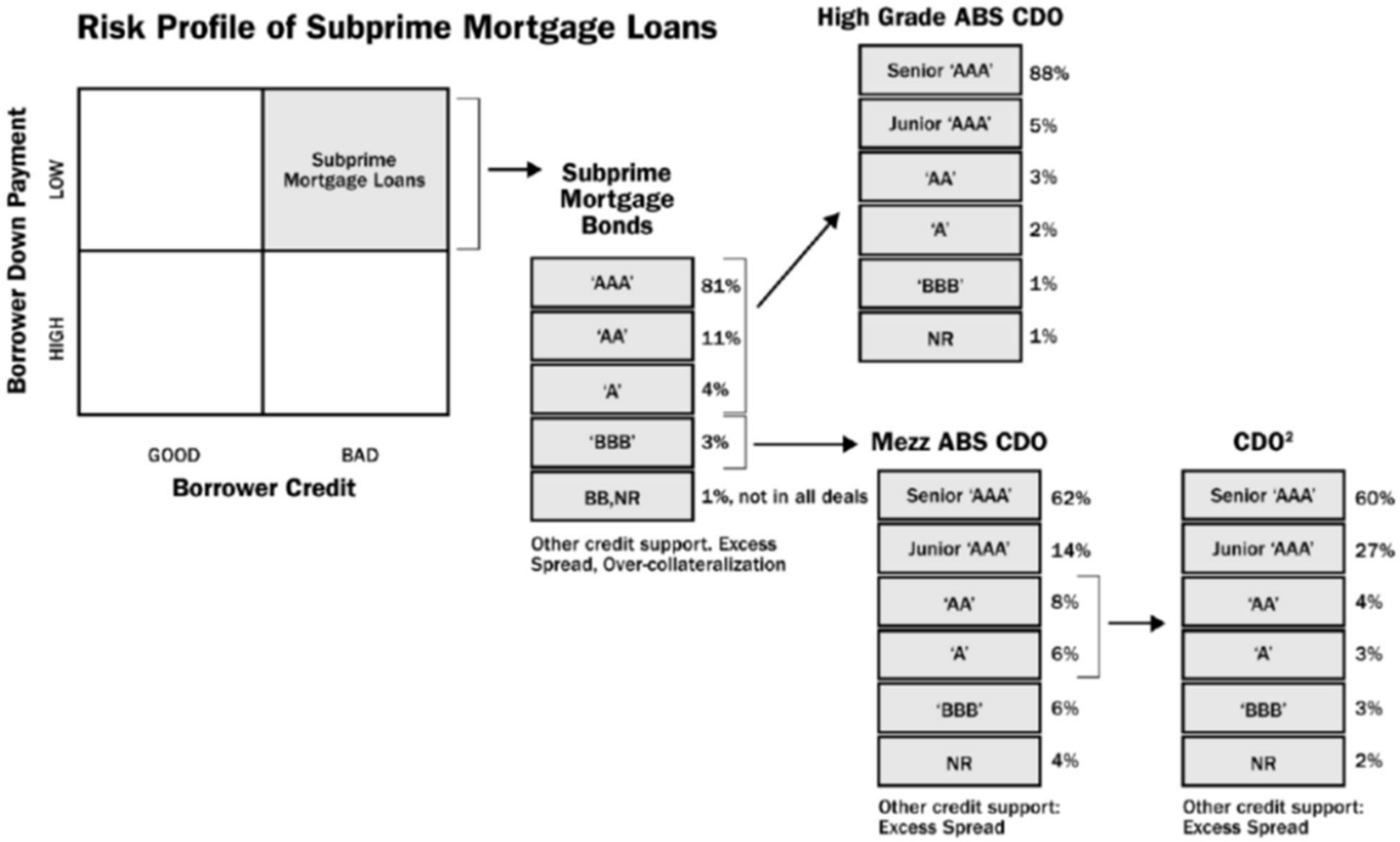
Source: UBS.

MBS Payments



Source: Kevin Kendra, Fitch, "Tranche ABX and Basis Risk in Subprime RMBS Structured Portfolios," Feb. 20, 2007.

MBS to CDO



Source: UBS, "Market Commentary," December 13, 2007.

Nonlinearities in Risk for CDO, CDO2

Table 2

Summary Statistics for CDO and CDO^2 Tranches in our Simulation under Baseline Parameters

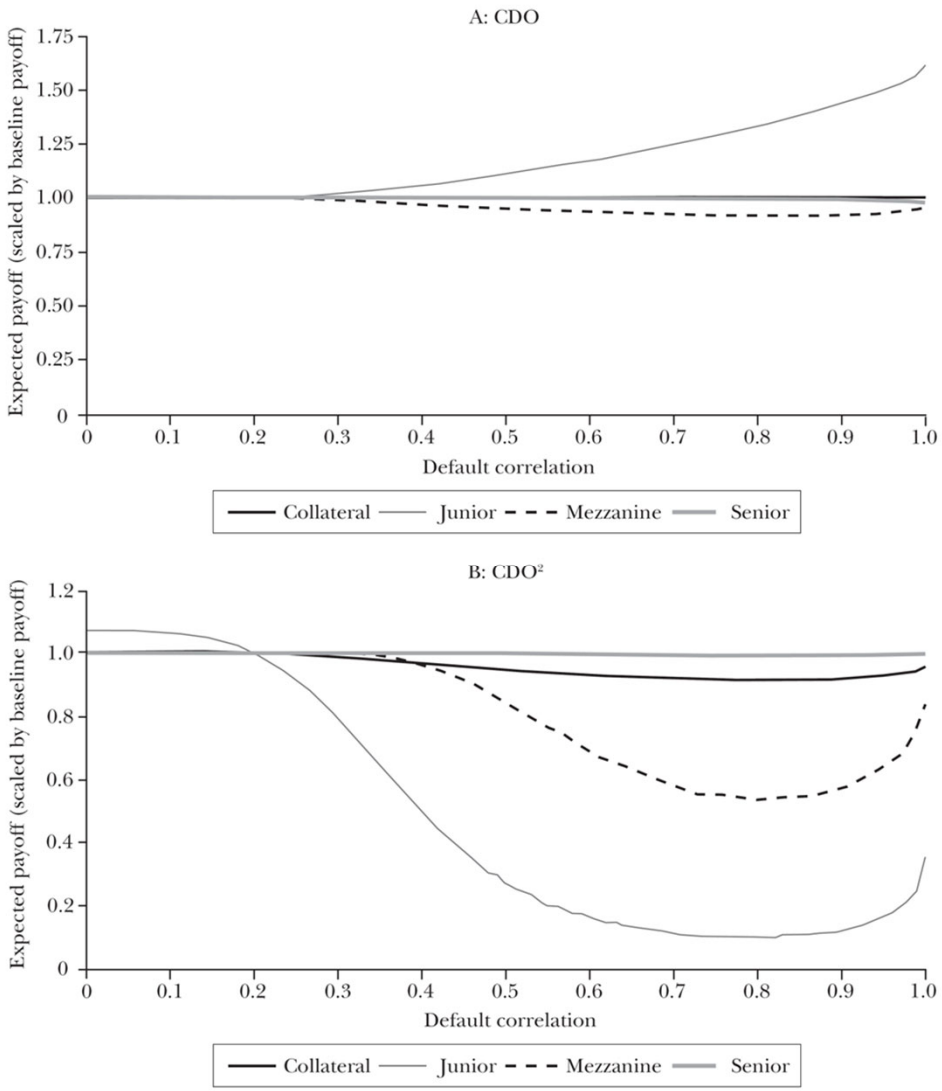
	Attachment points	*Default probability*	*Expected payoff*	*Rating*
CDO				
Junior	0%–6%	97.52%	0.59	NR
Mezzanine	6%–12%	2.07%	> 0.99	BBB−
Senior	12%–100%	< 0.00%	> 0.99	AAA
CDO^2 ([6, 12])				
Junior	0%–6%	56.94%	0.93	C
Mezzanine	6%–12%	< 0.00%	> 0.99	AAA
Senior	12%–100%	< 0.00%	> 0.99	AAA

Note: While the parameter values used in our simulation do not map into any particular market, they were chosen to mimic broadly the types of collateral and securitizations commonly observed in structured finance markets.

Sensitivity to Default Correlation

Figure 1

Sensitivity of CDO and CDO^2 to Changes in Default Correlation



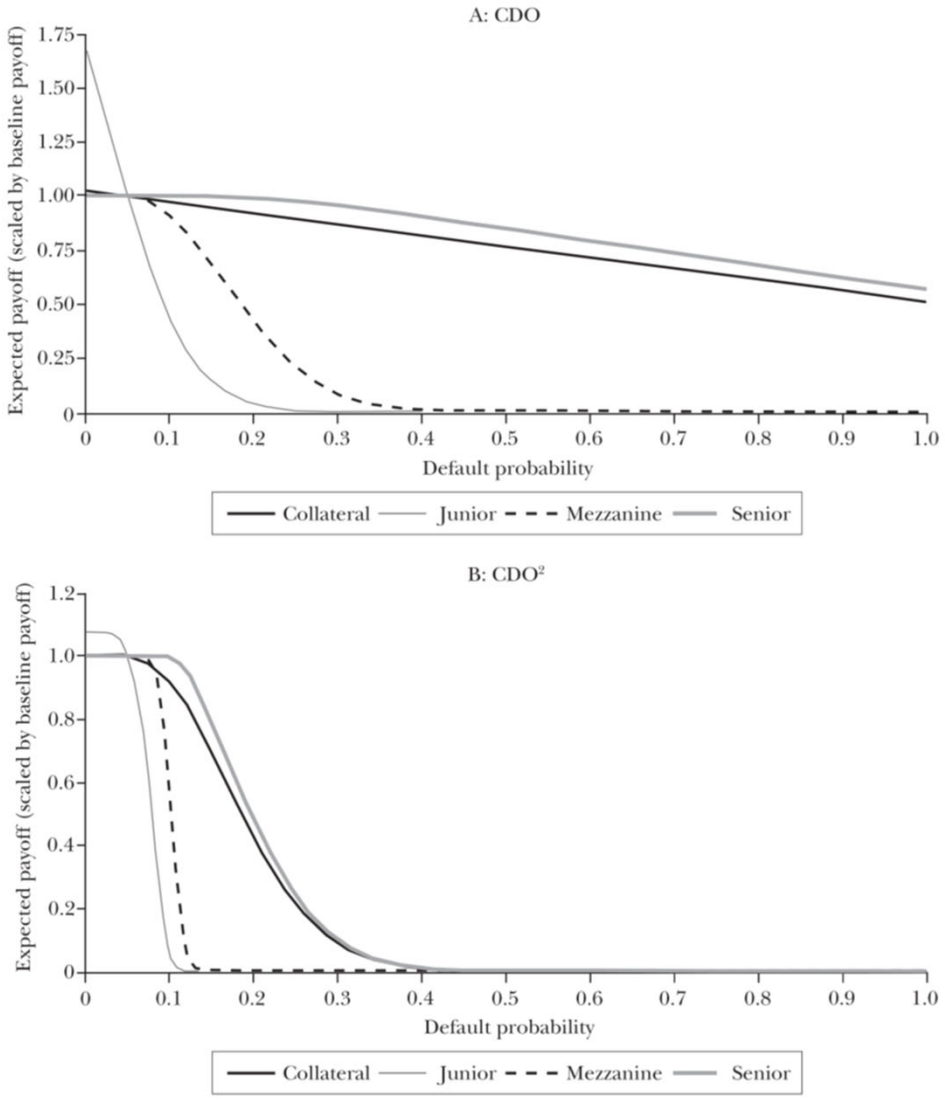
Note: Figure 1 explores the sensitivity of the original collateralized debt obligation and the CDO^2 tranches to changes in default correlation for bonds *within* each collateralized debt obligation. The correlation in defaults for bonds belonging to different collateral pools remains fixed at zero. The figure displays the expected payoff as a function of the default correlation, normalized by the expected payoff under the baseline calibration.

For rho=0.20

Sensitivity to Default Probability

Figure 2

Sensitivity of CDO and CDO^2 to Changes in Default Probability



Note: Figure 2 explores the sensitivity of the original collateralized debt obligation and the CDO^2 tranches to changes in the default probability for bonds in each collateralized debt obligation. The figure displays the expected payoff as a function of the default probability, normalized by the expected payoff under the baseline calibration.