



A Mortgage Product Primer

**Mortgage Strategies
Goldman, Sachs & Co.
Fall 2004**



Table of Contents

- I. Mortgage Overview**
 - II. Mortgage-Backed Security (MBS) Overview**
 - III. Agency vs. Non-Agency MBS**
 - IV. MBS Collateral**
 - Jumbo (Prime and Hybrid)
 - Subprime
 - Alt-A
 - FHA/VA Reperforming
 - Scratch and Dent
 - V. MBS Structures**
 - VI. Commercial Mortgage-Backed Securities (CMBS)**
 - VII. Asset-Backed Securities (ABS)**
 - VIII. Collateralized Debt Obligations (CDOs) / Collateralized Loan Obligations (CLOs)**
 - IX. Constant Maturity Mortgage (CMM)**
-



I. Mortgage Overview



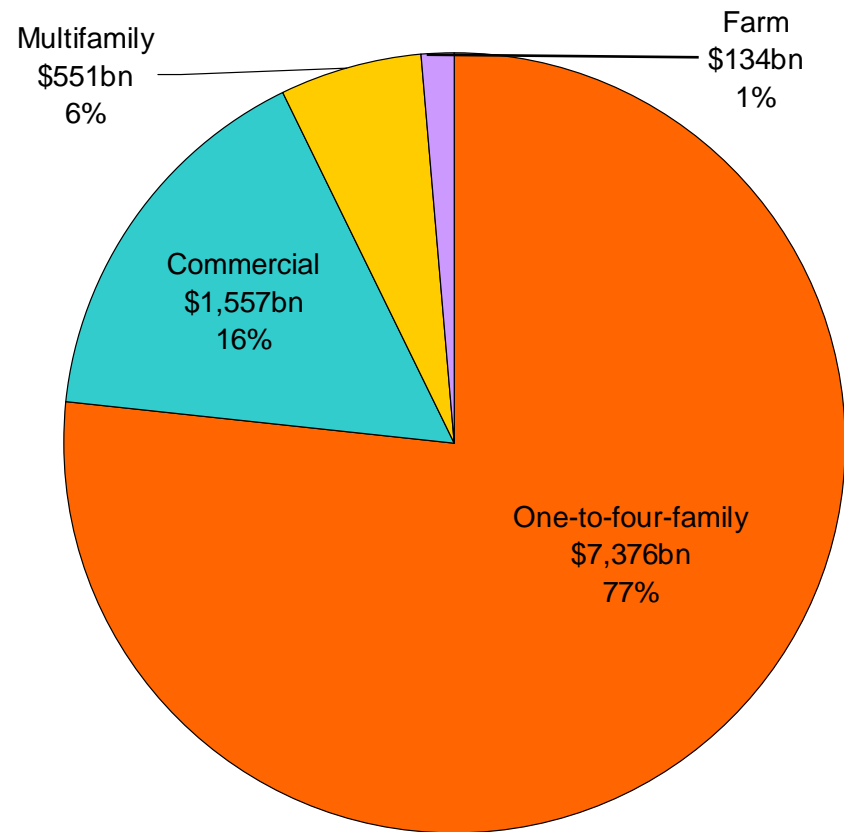
What Is a Mortgage?

- A mortgage is a contract under which a borrower (the mortgagor) pledges a structure and/or a piece of property as collateral for a loan from a lender (mortgagee).
 - The contract includes a loan amount, an interest rate, a frequency of payments and a loan term.
- This contract gives the lender the right to foreclose on the loan and seize the property in the event that the mortgagor fails to make the contractual payments. Such failure is called a default.
- Typical mortgage originators (lenders) include commercial banks, thrifts, and mortgage bankers.
 - Originators earn income by charging an origination fee (measured in percentage points, paid by the mortgagor at the closing), application fees and processing fees.
- Four types of properties that can be collateral for mortgages:
 - Residential real estate
 - Single family (one-to-four-family) (houses, mobile homes)
 - Multi-family (more than four-family) (condominiums, cooperatives (co-ops))
 - Non-residential real estate
 - Commercial (office buildings, shopping centers, hospitals, industrial plants)
 - Farm properties



The Mortgage Market

- At the end of the first quarter of 2004, \$9.6 trillion mortgages were outstanding.
- The breakdown of these mortgages by property type is as follows:



Source: Federal Reserve Flow of Funds 1Q2004 report



Mortgage Contract Characteristics

Amount

- The amount of the loan is usually lower than the value of the property used as collateral.
- The ratio of the loan amount to the value of the underlying collateral is called the loan to value ratio (LTV).
 - The lower this ratio, the more protection the mortgagee has, because the higher property value is backing a smaller loan. In the case of default, the mortgager has a better chance of recovering the entire loan amount upon foreclosure and sale.

Term

- The term of a mortgage can vary; however, the most common mortgages have 15- or 30-year maturities.
- The term of the loan is critical in determining the periodic payments.
- All else being equal on a flat payment structure, the longer the loan term, the less each payment will be and the more total interest will be paid over the life of the loan.

Frequency of Payment

- Most mortgages have monthly payments; however, a payment schedule is determined at the origination of the mortgage and expressed explicitly in the mortgage contract.
- Throughout this presentation, we assume payments are remitted monthly.



Mortgage Contract Characteristics (Continued)

Rate

- Mortgage rates are the cost to a mortgagor for borrowing money. This rate is referred to as the interest on the mortgage.
- Rates are quoted annually, but paid in installments determined in the contract (frequency of payment), usually monthly.
- Rates can be fixed for the life of the loan, they can float based on an index and a spread, or they can be fixed for a set period and then begin to float. Floating rate mortgages typically have life caps as well as periodic caps.
- The main characteristics used in determining mortgage rates are:
 - Type;
 - Loan amount;
 - Prevailing rates (can vary by locale); and
 - Creditworthiness as measured by:
 - FICO score (300 to 850, higher is better) calculated by companies such as Experian, Trans Union, and Equifax;
 - Loan-to-value ratio (lower is better);
 - Debt-to-income ratio (lower is better);
 - Payment-to-income ratio (lower is better).



Mortgage Contract Characteristics (Continued)

Payment schedule

- Several schedules can be used to guarantee full payment of principal by the maturity date.
 - The most common is a flat amortization schedule: Monthly payments are flat and principal is paid down after interest has been fulfilled.
 - Earlier in the mortgage, more of each payment is used to pay interest; at the end of the mortgage term, almost all of each payment is used to pay down principal.
 - In a floating rate mortgage, when the rate re-sets, the monthly payment increases or decreases accordingly to guarantee the mortgage fully amortizes.
 - Another type of payment schedule is a balloon structure.
 - The balance does not amortize fully, and the remaining principal is paid in a lump sum at maturity.
 - In an interest only mortgage, only interest is paid until the maturity date, when the face amount of the mortgage is due.



Mortgage Contract Characteristics

- Example

- The most common single-family mortgage has the following characteristics:
 - 30-year maturity;
 - Monthly payments (total term of 12 months x 30 months = 360 months);
 - Fixed rate; and
 - Flat amortization.
- In recent years, floating and hybrid mortgages have become more common.
 - The yield curve has steepened, making these types of loans attractive (though long-term rates are low, short-term rates are even lower).
 - Borrowers are also becoming more sophisticated in understanding their interest rate risk, and in taking advantage of the most economic debt instrument to finance their needs.



Calculating Mortgage Payments

- In a flat amortizing fixed mortgage, the monthly payment is determined at the beginning of the contract. Assume that A is the original balance, r is the interest rate, and N is the number of months in the contract. Then, the monthly payment is equal to:

$$\frac{A \left[\frac{r}{12} \left(1 + \frac{r}{12} \right)^N \right]}{\left[\left(1 + \frac{r}{12} \right)^N - 1 \right]}$$

- In a fixed amortizing mortgage, if the original balance is \$250,000 and the rate is 6.0% for 30 years, each month the principal and interest payment is:

$$\frac{250,000 \left[\frac{6.0\%}{12} \left(1 + \frac{6.0\%}{12} \right)^{360} \right]}{\left[\left(1 + \frac{6\%}{12} \right)^{360} - 1 \right]} = \$1,498.88$$



Calculating Mortgage Payments (Continued)

- Using the previous calculation (and example), a cash flow schedule can be created:

Month	Starting Balance	Interest	Principal	Ending Balance
1	250,000	1,250	249*	249,751
2	249,751	1,249	250	249,501
3	249,501	1,248	251	249,250
⋮	⋮	⋮	⋮	⋮
129	205,528	1,028	471	205,057
130	205,057	1,025	474	204,583
131	204,583	1,023	476	204,107
⋮	⋮	⋮	⋮	⋮
358	4,452	22	1,477	2,975
359	2,975	15	1,484	1,491
360	1,491	7	1,491	-

* Note that $\$1498.88 - \$1250.00 = \$248.88$



Calculating Mortgage Payments (Continued)

- The previous calculation demonstrated how to find the total payment for a mortgage and develop a schedule for the life of the loan.
- In order to determine which portion of the payment is interest and which is principal in any given month, the following calculation can be completed.
 - For a mortgage with an N-month term, rate r , and initial balance A :

Interest payment in month n :

$$\frac{A\left(\frac{r}{12}\right)\left[\left(1+\frac{r}{12}\right)^N - \left(1+\frac{r}{12}\right)^{n-1}\right]}{\left[\left(1+\frac{r}{12}\right)^N - 1\right]}$$

Principal payment in month n :

$$\frac{A\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n-1}}{\left[\left(1+\frac{r}{12}\right)^N - 1\right]}$$



Calculating Mortgage Payments (Continued)

- Given the same example on the previous page, in month 130, the interest payment is:

$$\frac{250,000 \left(\frac{6\%}{12} \right) \left[\left(1 + \frac{6\%}{12} \right)^{360} - \left(1 + \frac{6\%}{12} \right)^{130-1} \right]}{\left[\left(1 + \frac{6\%}{12} \right)^{360} - 1 \right]} = \$1,025.28$$

and the principal payment is equal to

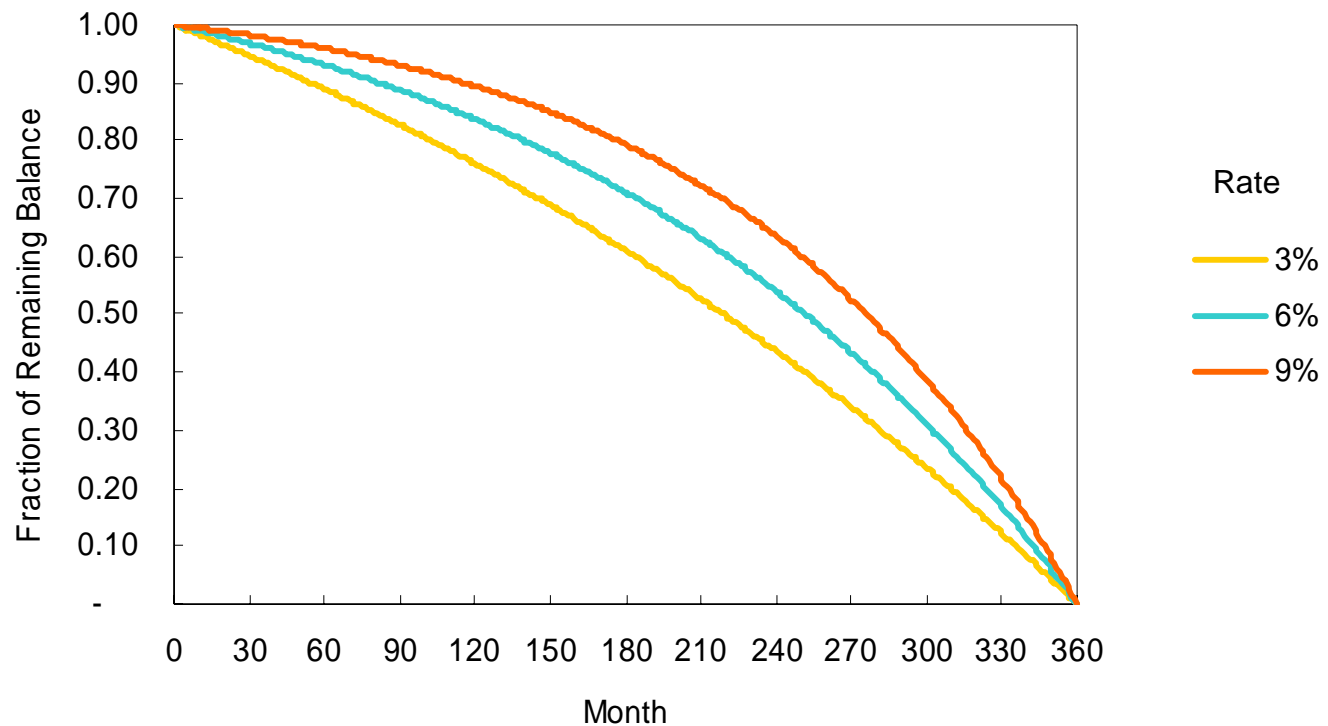
$$\frac{250,000 \left(\frac{6\%}{12} \right) \left(1 + \frac{6\%}{12} \right)^{130-1}}{\left[\left(1 + \frac{6\%}{12} \right)^{360} - 1 \right]} = \$473.60$$

- Please note that $\$1,025.28 + \$473.60 = \$1,498.88$, the total payment determined on the previous page.



Calculating Mortgage Payments (Continued)

- The higher the mortgage rate, the greater the proportion of each monthly payment is devoted to interest. Hence, for the same amount and term, the higher the rate, the larger fraction of the original principal balance is left in any given month.





Prepayment Option

- Mortgagors have the right to reduce principal ahead of schedule, which is called a prepayment option.
 - Any payments made by the borrower in excess of scheduled payments are called prepayments. Cash ultimately obtained from a default and foreclosure sale of property constitute prepayments as well.
 - Prepayments may occur for one of several reasons:
 - Refinancing into a new mortgage with a lower interest rate;
 - Sale of property because of relocation or a move to a new house;
 - Defaults;
 - Partial prepayments (curtailments); or
 - Homeowner motivations beyond rational economic (interest-rate related) considerations, which play an important role in assessing prepayment risk.



Summary

- Of all the types of consumer loans originated each year, mortgages are the largest in total dollar volume.
 - To continue to originate mortgages at the pace consumers need, additional sources of funding are necessary.
 - The rest of this presentation explains how the capital markets act as an effective source.



II. Mortgage-Backed Security (MBS) Overview



What Is a Mortgage-Backed Security (MBS)?

- An MBS is when a number of mortgages that are similar in amounts, terms, rates, and structure are combined into a single group.
- Mortgage documents associated with this group are transmitted to a custodian, reviewed by a trustee, and are assigned an identification (pool) number by an issuing entity (described in greater detail in following sections).
- An MBS is issued with a face amount equal to the cumulative outstanding principal balance of the mortgages (original balance) and with certain characteristics such as bond coupon.
- The mortgages that have been pooled together serve as the collateral for the security.
- Because loans underlying a pool are similar but not identical, properties of an MBS must be described using weighted averages by face value:
 - WAM – weighted average maturity;
 - WAC – weighted average coupon; and
 - WALA – weighted average loan age.



What Is a Mortgage-Backed Security (MBS)?

- The MBS assumes the same characteristics as the collateral that secure the principal and interest payments.
 - Bonds that are based on collateral with fixed rates are called fixed rate MBS.
 - Bonds that are based on collateral with floating rates are called adjustable rate mortgage-backed securities, or ARMs
 - Bonds that are based on collateral with a fixed period and then a floating period of rates are called hybrid MBS. The most common hybrid MBS are 3/1, 5/1, 7/1, and 10/1, meaning a fixed period of 3, 5, 7, and 10 years, respectively, and then a rate reset every year.



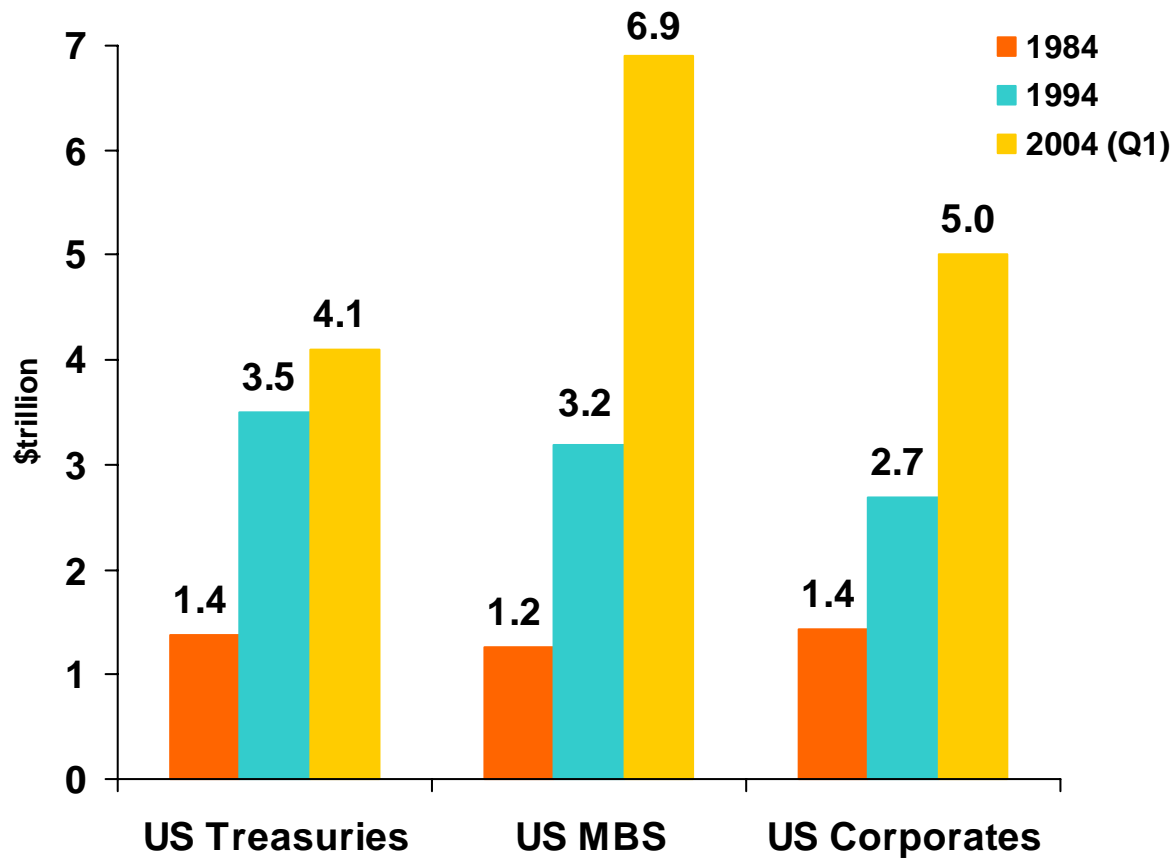
Benefits of Securitization

- Benefits of securitization to mortgage lenders include:
 - More efficient use of capital;
 - Increased velocity of origination (origination fee and servicing fee) ;
 - Greater balance sheet liquidity;
 - Funding diversification;
 - Asset-liability management;
 - Gain on sale accounting treatment (FAS#125);
 - Ability to manage portfolio growth; and
 - A business exit strategy.
- Benefits to investors include:
 - Yield premium over Treasuries;
 - Limited credit risk; and
 - Liquidity.



The MBS Market

- MBS are currently the largest component of US fixed income markets based on outstanding balance.

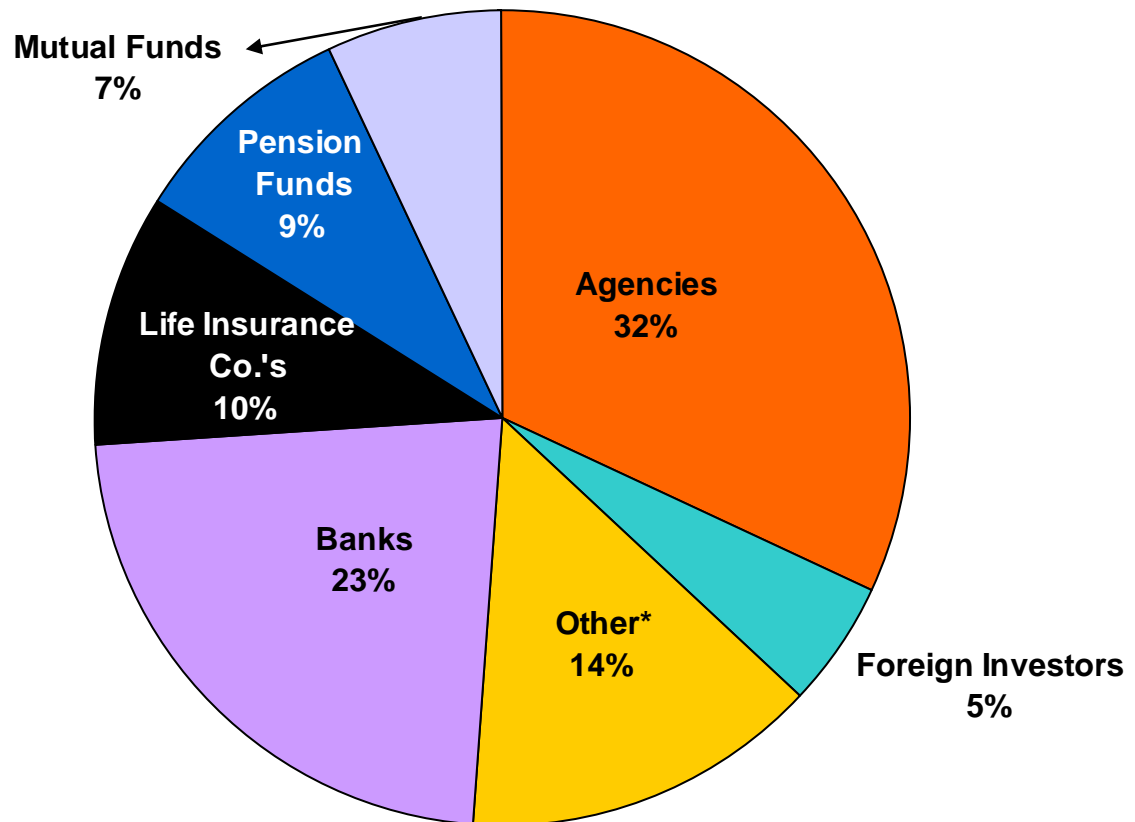


Source: Federal Reserve Flow of Funds, June 10, 2004, debt growth table



The MBS Market (Continued)

- Many different types of investors buy MBS.
- Mortgage- and asset-backed security holdings by investor type 2003 at year-end are as follows:



Source: Inside MBS & ABS

* Other consists of Private Individuals, Finance Companies, MBS deal Inventory, REITs, Federal Credit Unions, HedgeFunds/ Non-Profits/ State and Local Gov't



Prepayments

- Mortgagors have the statutory right to re-finance at their discretion, notwithstanding prepayment penalty mortgages (PPMs). This is called the prepayment option.
- Prepayments are usually the most important factor in valuing MBS.
- Prepayments affect MBS through *call risk* and *extension risk*.
 - Call risk occurs when monthly cash flows are earlier than expected and hence the weighted average life of the bond is shortened. This is caused by higher-than-expected prepayments:
 - This benefits the holder of a discount MBS (i.e., the holder bought the MBS for less than face principal value – below par), as principal purchased below par is returned early at par.
 - This harms the holder of a premium MBS (i.e., the holder bought the MBS for more than face principal value – above par), as principal purchased above par is returned early at par.
 - Extension risk occurs when monthly cash flows are slower than expected and hence the weighted average life of the bond is extended. This is caused by lower-than-expected prepayments:
 - This harms the holder of a discount MBS, as the lower prepayments prolong the period of below-market coupon payments.
 - This benefits the holder of a premium MBS, as the lower prepayments prolong the period of above-market coupon payments.



Prepayments

- Reinvestment risk
 - Prepayments are greater when interest rates are low, causing cash from MBS to be returned faster from above market mortgages.
 - This creates the problem of having unexpected cash to reinvest in securities with lower yields.



Prepayments

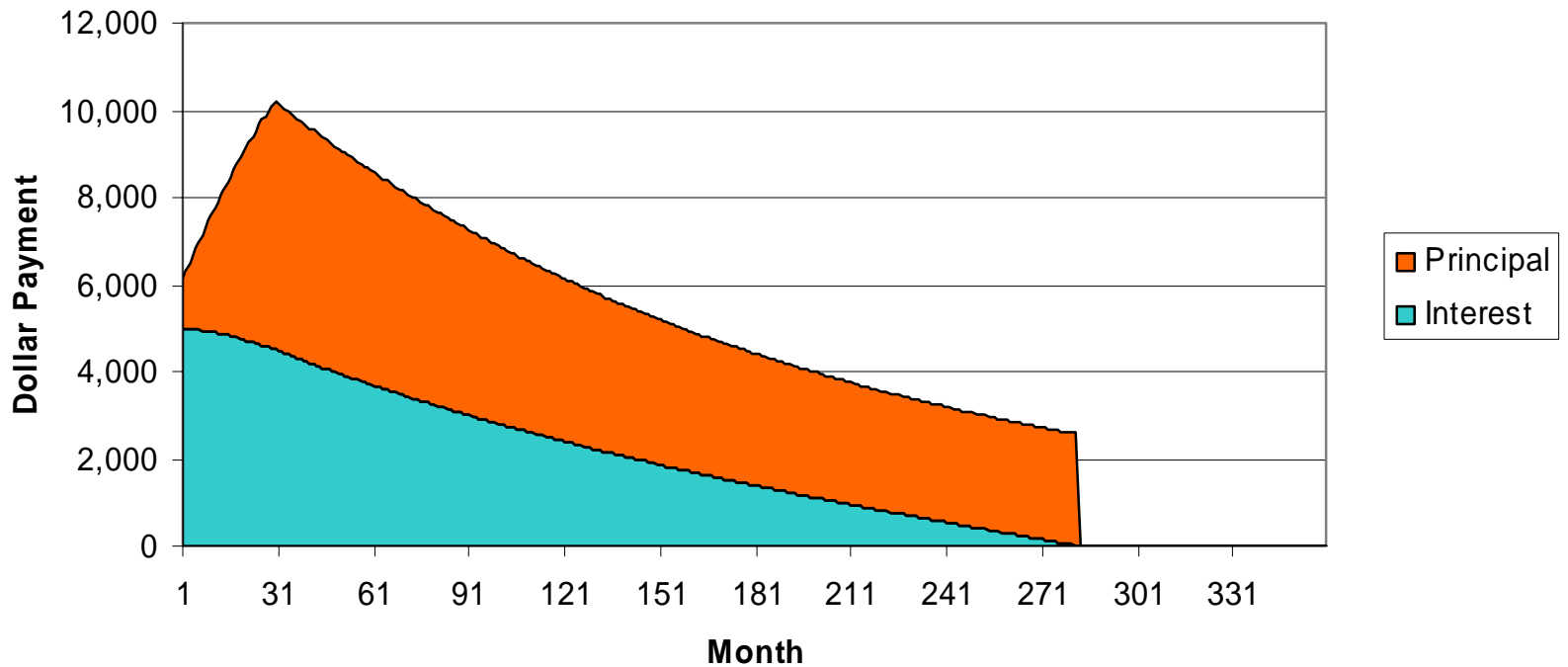
- Measurements

- The following are commonly used prepayment measurements:
 - SMM (single monthly mortality rate):
 - Percentage of mortgages outstanding at the beginning of the month that are prepaid during the month.
 - CPR (conditional prepayment rate):
 - SMM expressed at an annual rate: $CPR = 1 - (1 - SMM)^{12}$
 - PSA (Public Securities Association):
 - A CPR ramp model that accounts for seasoning of the loans and is modeled off of prepayment relocation assumptions.
 - This ramp is made up of annualized prepayment rates of 0.2% CPR in the first month, 0.2% increases in every month thereafter until the 30th month, when the rate reaches 6% and stays at this level.
 - This model acknowledges that prepayment assumptions will change; hence PSA is thought of as a baseline and referenced with a % difference (i.e., 120% PSA assumes 20% higher prepayments than PSA alone).
 - This baseline can be estimated by the prepayment history of deep discount coupons, as prepayments on such coupons primarily reflect housing turnover.
 - At a lower-than-market coupon, home owners do not have an incentive to refinance.
 - % of PSA is used to reflect views on future changes in the refinancing incentive.



Prepayments - PSA

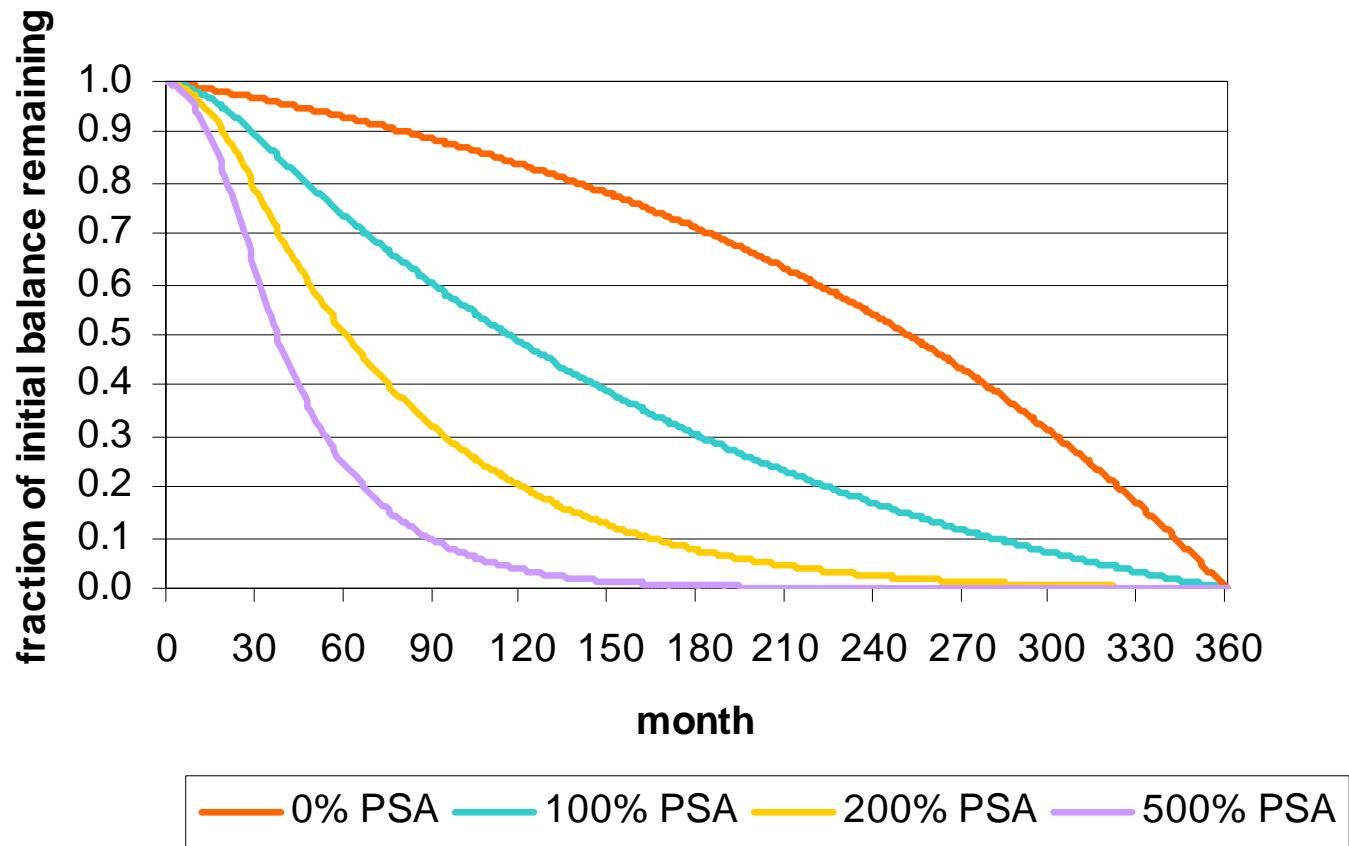
- On a pool of mortgages with a face value of \$1,000,000, a 360 month weighted average maturity, a 6.0% weighted average interest rate, at 100% PSA, the payments can be diagrammed as follows:





Prepayments - PSA (Continued)

- Based on this, PSA prepayments affect principal paydown:





Prepayments

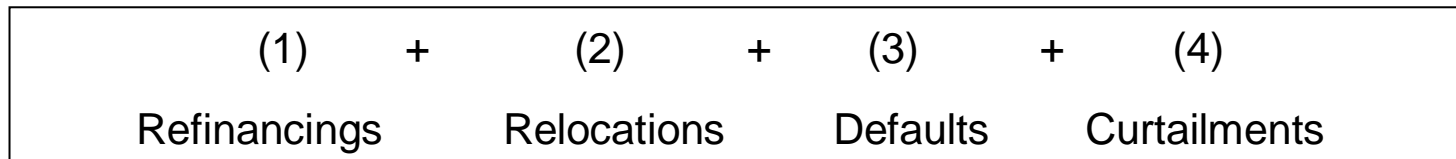
- Burnout

- Borrowers who are usually the first to refinance and drop out of a mortgage pool generally:
 - Are more sophisticated financially (optimally exercising their option to refinance);
 - Face lower refinancing costs;
 - Have more built-in equity in their homes;
 - Have higher incomes.
- As a result, for the same refinancing incentive, more-seasoned pools show slower prepayment speeds. This is generally referred to as Burnout.
 - As seasoned premium mortgages accumulate more burnout and thus are less sensitive to declines in mortgage rates, prepayment risk is generally lower.
 - Because of the perceived lower optionality, investors usually are willing to pay more for vintage premiums than for new origination of the same coupon.



Modeling Prepayments

- A large variety of mortgage and market data are available for study, including:
 - Loan types;
 - Coupons;
 - Vintages;
 - Dollar balances;
 - Mortgage rates;
 - Shape of the yield curve;
 - Refinancing alternatives;
 - Prepayment costs;
 - Housing values;
 - Tax rates;
 - Regulations; and
 - Others.
- A prepayment function is generally based on four sub-models of homeowner prepayment decisions:



- Different types of mortgages (e.g. FNMA or GNMA) require different prepayment functions.



Modeling Prepayments (Continued)

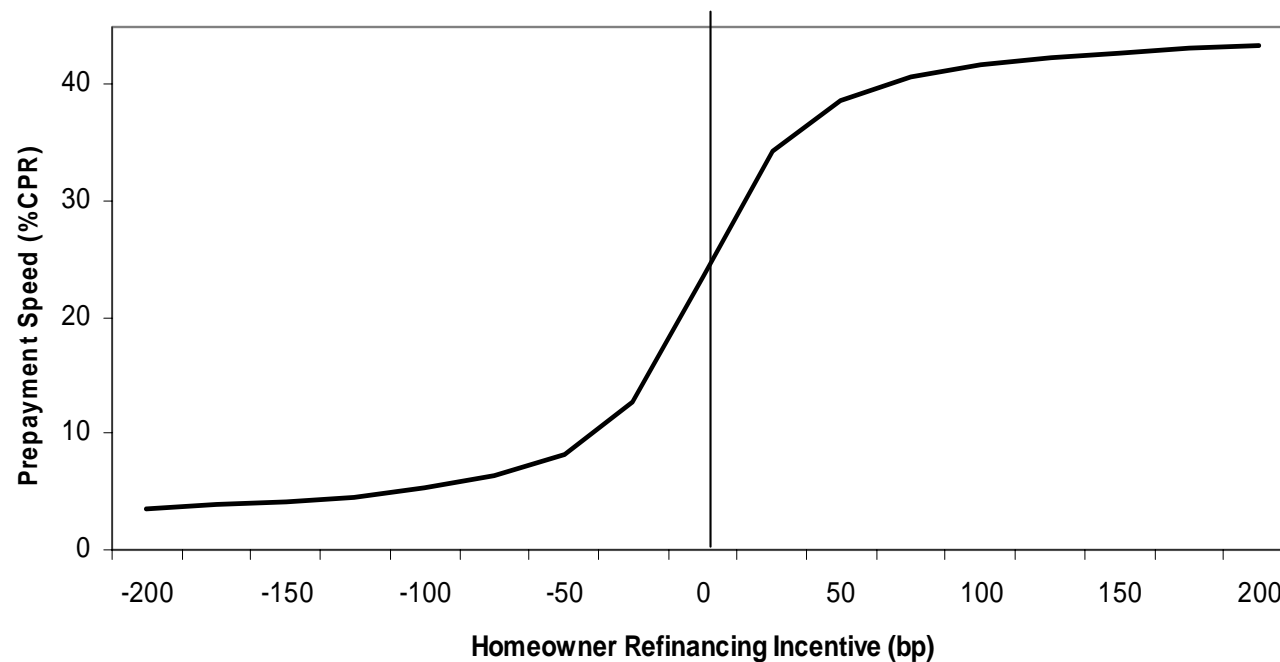
- Prepayment functions are generally estimated by fitting actual prepayment speeds to various key variables, including:
 - Level of interest rates in various products;
 - Shape of the yield curve;
 - Mortgage spreads;
 - Refinancing costs (fees, up-front points);
 - Loan age, seasonal factors; and
 - Macroeconomic factors such as housing prices, aggregate income, etc.
- Prepayment models should:
 - Consistently track absolute prepayment rates;
 - Consistently track relative prepayment rates (achieve consistent results across various mortgage types, coupons and vintages);
 - Be robust in treating prepayment outliers; and
 - Be able to update models to reflect structural changes in the mortgage market.
- In practice, prepayment models are less than perfect. Hence, the MBS valuation is always subject to prepayment model risk (the risk that prepayment predictions are systematically biased).
 - One known area of possible prepayment model risk, is that mortgagors usually do not or cannot optimize their right to exercise their prepayment options.



Modeling Prepayments

- Refi - S Curve

- Borrowers have various thresholds for refinancing under different incentives.
- Refinancing speeds are determined by measuring the difference between a borrower's mortgage rate and the current market mortgage rate.
- The following curve was developed as a general guideline to when borrowers refinance; however, each different type of mortgage pool has its own curve.





Modeling Prepayments

- The Output

- To value an MBS, you must estimate the cash flows in future months; however, cash flows depend on future interest rates - both on their levels and on the paths they took to reach those levels.
- One way to model these cash flows is to assume that future rates implied by the forward curve will be realized:
 - At each payment date there will be a yield curve implied by forwards.
 - By using this yield curve in combination with a separate model of how mortgage rates respond to the yield curve, future refinancing incentive can be calculated.
 - Future prepayment rates can be found with the S-curve.
 - This will yield cash flows, which can be discounted to value the MBS.
- Problem: What if the forward rates aren't realized?



Modeling Prepayments

- Option-Adjusted Spread (OAS)

- In order to take this volatility and uncertainty of rates into account, a model to simulate future rate paths is used.
- Mortgage rates are generated as a function of these simulated rates, using a separate model of mortgage spreads with respect to interest rates.
- Prepayment rates, along each interest rate path, are calculated using the prepayment function, and mortgage cash flows (both scheduled and prepayments) are projected along each interest rate path.
- These projected cash flows are then discounted at the spot rates along each interest rate path.
- The option-adjusted spread (OAS) is then calculated by equating the average present value of projected cash flows under all the simulations to the market price of the security.
 - If two bonds are equal in many respects, then a high OAS implies relative cheapness and a low OAS implies relative richness.
- Note that every prepayment model is different; hence, OAS is different based on these calculations.



Modeling Prepayments - Embedded Option

- Owing to interest rate volatility, the prepayment characteristics of the underlying mortgages can create (or decrease) value.
- We can assume that interest rates have zero volatility and value an MBS along the base-case scenario: the forward mortgage rates curve.
- The spread that results between valuing the MBS along the forward mortgage rates curve and valuing the MBS along a LIBOR/swaps curve is called a zero volatility option adjusted spread (ZVO).
 - This is the excess return over swaps that an MBS investor would earn if interest rates were non-random and the embedded option had no value.
 - OAS, on the other hand, reflects the expected return when interest rates are volatile and the embedded option has value.
- The implied cost of the option embedded in an MBS is the difference between the ZVO and OAS (**ZVO = OAS + option cost**).



Convexity and Duration

- Convexity measures the sensitivity of a bond's price to larger changes in yield.
- Duration is the percentage change in the price of an MBS due to a 100 basis point change in yield. For example, the value of an MBS with a duration of 3 will decline about 3 points for each 100 basis point increase in interest rates.
- Therefore, convexity is the sensitivity of a bond's duration to changes in yield: $\Delta D = -C \times \Delta y$
- When looking at the price function of an MBS changing across small variations in yield, remember that prepayments will also vary. Given P = price, and Δy = change in yield,

$$\text{Duration} = d = \frac{P(-\Delta y) - P(+\Delta y)}{2P(0)\Delta y}$$

$$\text{Convexity} = c = \frac{P(+\Delta y) + P(-\Delta y) - 2P(0)}{2P(0)(\Delta y)^2}$$



Convexity and Duration (Continued)

- As yields fall, mortgage rates fall and prepayments rise (due to the refinancing incentive), which causes cash flows to increase in the near term and “shortens” the MBS. This will reduce duration.
- Conversely, as yields rise, mortgage rates rise and prepayments decrease, which decreases cash flows in the near term and “extends” the bond. This will increase duration.
- This reverse relationship is what causes negative convexity:
 - Holders of MBS generally do not want to be exposed to interest rate risk. They can hedge their MBS with another security such that as MBS prices fall (when yields rise), the hedged security’s price rises, and vice versa.
 - The hedge has a duration opposite to that of the MBS.
 - Typically, the hedge is a short position in 10-year Treasuries or swaps.



Convexity and Duration

- The Mortgage Market in Aggregate



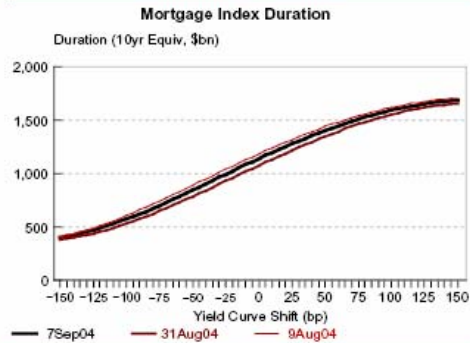
Mortgage Index Risk Report

Pricing Date: 7Sep04

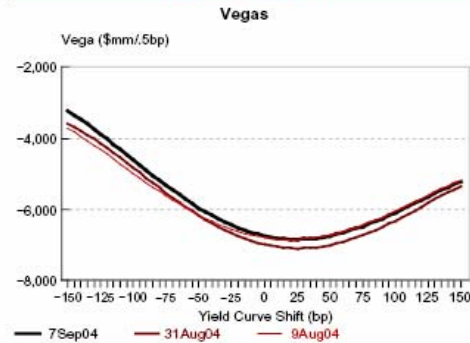
Interest Rate Products

FICC Strategies

Mortgage Duration



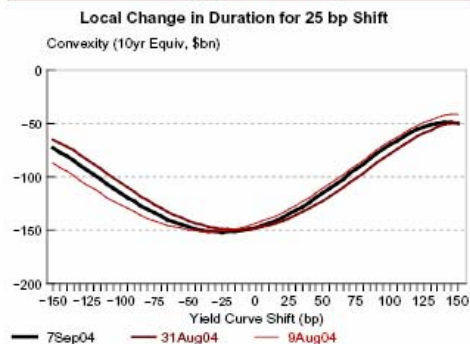
Mortgage Vegas



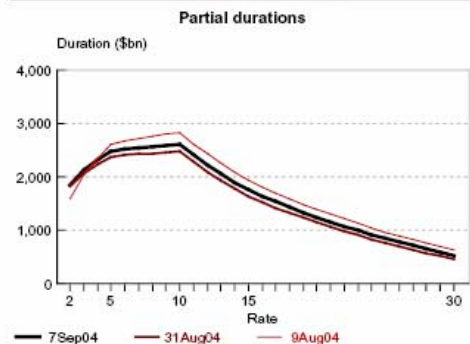
Key Rates

Rate	Curr	Change (bp)	
		1wk	1mo
2yr UST	2.57%	+15.5	+14.0
10yr UST	4.25%	+11.6	+0.1
2-10 UST	167.9	-4.0	-13.8
2yr Swap	2.96%	+18.5	+14.4
10yr Swap	4.71%	+13.1	-0.6
2-10 Swap	175.7	-5.4	-15.0
CC Mtg Yld	5.28%	+9.7	-1.5
3y7y Imp Vol(bp)	6.7	-0.1	-0.2

Mortgage Convexity



Partial durations



Mortgage Index Durations

Shift	Index Price	Duration (\$bn 10yr)			Convexity (\$bn 10yr)		
		Curr	1-wk	1-mo	Curr	1-wk	1-mo
-150	104.87	410	385	411	-72	-64	-86
-125	104.61	475	443	495	-92	-83	-106
-100	104.25	577	535	611	-114	-104	-125
-75	103.78	705	654	747	-133	-125	-140
-50	103.21	848	790	894	-146	-140	-148
-25	102.54	997	934	1044	-151	-148	-149
0	101.77	1145	1081	1190	-146	-147	-143
25	100.92	1284	1223	1325	-134	-138	-129
50	99.98	1409	1353	1446	-114	-121	-110
75	98.96	1515	1467	1547	-91	-100	-88
100	97.87	1599	1559	1626	-69	-77	-66
125	96.70	1658	1625	1682	-52	-58	-48
150	95.47	1690	1662	1714	-49	-48	-40

Partial Durations

Rate	Duration (\$bn/100 bp)		
	Curr	1-wk	1-mo
2y	1848	1828	1600
5y	2495	2389	2617
10y	2624	2486	2839
15y	1765	1643	1946
30y	536	468	632



III. Agency vs. Non-Agency MBS



Agency vs. Non-Agency MBS

- The primary bifurcation in MBS is between agency and non-agency collateral.
- Agency securities have underlying collateral that is guaranteed or insured by one of three government or government-sponsored agencies:
 - Federal National Mortgage Association or “Fannie Mae” (FNMA);
 - Federal Home Loan Mortgage Corporation or “Freddie Mac” (FHLMC); or
 - Government National Mortgage Association or “Ginnie Mae” (GNMA).
- Non-agency securities are excluded from these guarantees / insurance if they have certain characteristics, such as:
 - “Jumbo” loans – Fannie Mae and Freddie Mac cannot buy loans with balances exceeding a limit set annually by the US government: \$322,700 in 2003 and \$333,700 in 2004;
 - Loans on second properties – vacation homes, investment properties;
 - Loans with insufficient documentation; or
 - Loans where the borrowers have credit history problems.

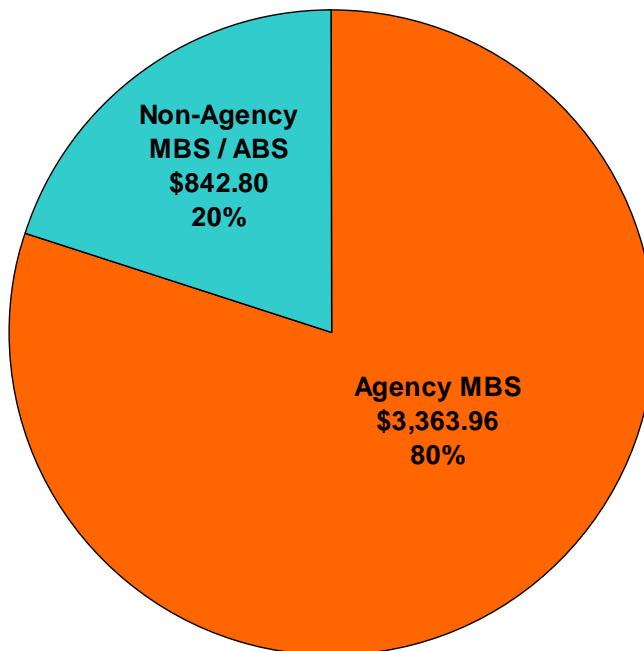


Agency vs. Non-Agency MBS - Market Breakdown

- The vast majority of MBS are issued through one of the government or government-sponsored agencies:

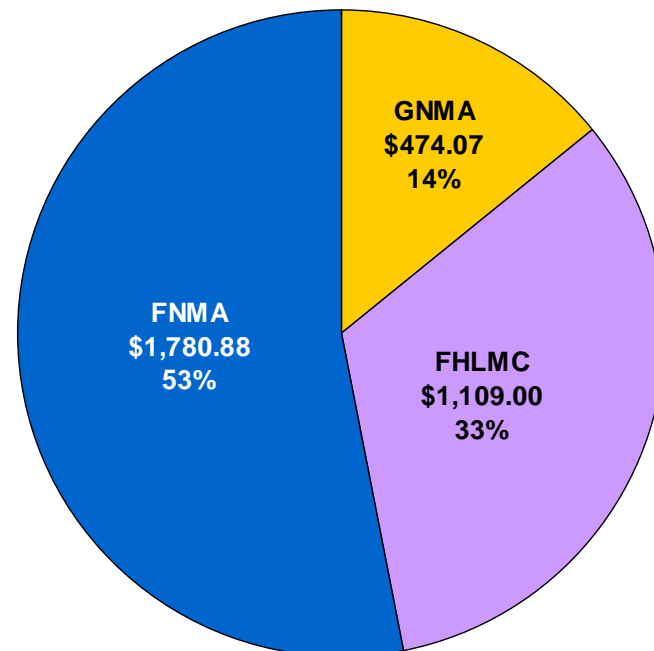
Outstanding Mortgage Securities

2003 Year-End
(In Billions)



Outstanding Agency Securities

2003 Year-End
(In Billions)



Source: The 2004 Mortgage Market Statistics Annual – Volume II. Includes GNMA MBS, FHLMC PCs, FNMA MBS, and Private MBS/ABS.



Agency vs. Non-Agency MBS - Comparison

	FNMA and FHLMC	GNMA
Status	<ul style="list-style-type: none"> ■ Guarantees are not backed by the full faith and credit of the US government, but it is unlikely the government would let either agency fail. ■ They are public companies and their stocks are traded on the NYSE. ■ The agencies have a funding advantage over other mortgage investors. ■ Agency debt trades tighter to treasuries than that of competitors due to “implied” government backing and credit line of the US treasury. 	<ul style="list-style-type: none"> ■ Wholly-owned entity of the Department of Housing and Urban Development (HUD). ■ Backed by the full faith and credit of the US government.
Security Parameters	<ul style="list-style-type: none"> ■ Conventional insured (non FHA/VA insured/guaranteed)¹ <ul style="list-style-type: none"> — \$333,700 loan limit — 80% max LTV — Certain property types 	<ul style="list-style-type: none"> ■ FHA (insured) / VA² (guaranteed) mortgages

1) FHA – the Federal Housing Authority; VA – Veterans Administration

2) The FHA maximum payout is \$203,000. The FHA guarantees the losses of interest due to the difference between the FHA debenture rate and the note rate; however, the FHA does not reimburse for the first two months of interest lost on foreclosures. In addition, the FHA will also cover two-thirds of foreclosure costs and certain other costs. The VA guaranty will cover: (i) 50% of the loan amount for loans under \$45,000; (ii) \$22,500 for loans between \$45,001 and \$56,250; (iii) 40% of the loan amount with a maximum of \$36,000 for loans between \$56,251 and \$144,000; and (iv) 25% of the loan amount with a maximum of \$60,000 for loans greater than \$144,000.



Agency vs. Non-Agency MBS - Comparison (Continued)

	FNMA and FHLMC	GNMA
Guarantee Fees	■ 5-20 bp per annum for guaranteeing timely payment of principal and interest on these securities.	■ 5-10 bp per annum for guaranteeing timely payment of principal and interest on these securities.
Mortgage Portfolio	■ FNMA and FHLMC have the largest mortgage investment portfolios in the market (Fannie = \$891 billion & Freddie = \$645 billion).*	■ No investment portfolio.

* As of June 2004



Agency vs. Non-Agency MBS

- Non-Agency

- Non-agency MBS are not guaranteed / insured by the federal government.
- In order to achieve a triple-A rating, the bonds must have sufficient levels of credit enhancement. This can be achieved through:
 - Several structuring methods, which will be described later in this presentation. One of which is subordination.
 - Senior/subordinate structures create “levels” of bonds such that the lowest rated tranches absorb credit losses first and the most senior tranches only experience credit losses if all the subordinate bonds are completely written down.
 - Third party guarantees, which are letters of credit from financial institutions and bond insurance that guarantee timely payment of principal and interest against losses up to some specified level for a fee.
 - Cash reserves, where underwriting profits or a servicing spread is set aside to cover default losses. If this is not used, then the underwriter receives the fees at the maturity of the security.
 - Over-collateralization, where extra collateral is placed in the deal (e.g. \$110 million of mortgages backs \$100 million in bonds). Any extra collateral that remains at maturity is usually returned to the originator.



Agency vs. Non-Agency MBS - Characteristics

	Agency	Non-Agency
Credit Protection	Agency Guarantee / Insurance	Subordination, third-party protection, cash reserves, over-collateralization
Credit Rating	Aaa/AAA	Aaa/AAA for senior class; Aa/AA or lower for subordinate class
Interest Shortfall	No	Potentially if high prepayment
Cleanup Call	1% (seldom executed)	Usually 10%, sometimes 1% or 5%
Liquidity	High	Low



IV. MBS Collateral



MBS Collateral

- Mortgage loans may have many different characteristics, as described in the first section of this presentation.
- Loans that do not have the characteristics needed to qualify for agency guarantee / insurance, are often used as collateral for non-agency MBS.
 - Each pool of loans has similar characteristics, but pools are structured differently, and have different features and performance.
- The main types of non-agency-eligible collateral are:
 - Jumbo (prime and hybrid): Loans that are not qualified for agency guarantee / insurance because of loan size.
 - Subprime: Loans further down the credit spectrum.
 - Alternative A (Alt-A): Loans in the middle-of-the-credit spectrum, missing documentation on prime borrowers and other characteristics that exclude these loans from being Prime.
 - FHA/VA Reperforming: Loans backed by GNMA that have been delinquent, bought out of the pool, and made to perform again, yet still do not qualify for securitization through FNMA or FHLMC.
 - Scratch and Dent: Exceptions to underwriting guidelines have been made in order to fulfill the loan (e.g. lower-than-acceptable FICO, impaired borrowers, etc.).



Jumbo - Characteristics

- Jumbo loans have balances exceeding the limit for agency conforming insurance.
- Fixed and floating loans with this characteristic are called jumbo prime loans; hybrid rate loans are called jumbo hybrid ARMs.
- Characteristics typical of Jumbo loans are:
 - FICO: 700+
 - Documentation: full conforming
 - Past delinquencies: 0
 - LTV: 80%
 - Mortgage insurance: Over 80%
 - Credit subordination level: 1% - 4%
- Top Issuers include: Goldman, Sachs & Co, Countrywide, Washington Mutual, Bank of America, Wells Fargo, GMAC-RFC, Impac, Chase, Redwood, Thornburg, First Horizon, ABN AMRO, IndyMac, GMAC, Citicorp, UBS Warburg, Lehman/SASCO, CSFB/ABSC, Bear Stearns, and Merrill Lynch.



Jumbo Hybrid ARMs

- Performance

- In a refinancing environment, prepays are generally faster because large monthly payments create a bigger refinancing incentive.
- Prepayment speeds are comparable or typically slower than agency collateral in a non-refinancing environment.
 - This creates a negative convexity worse than agency MBS.
- Banks like these types of loans because of their high credit quality, short duration, and wider spread than agency MBS.
- Agencies see these assets as fundamentally cheap, with wide OAS.
- Hybrid ARM MBS prepayments have closely tracked those of balloon loans (loans with an amortization schedule longer than the life of the loan, forcing a large payment at maturity).



Subprime - Characteristics

- The borrowers in these pools typically have credit problems, prior late payments on their mortgages, prior bankruptcies, or general problems with their bill paying histories.
- Typical characteristics of Subprime MBS are:
 - FICO: 500 – 640
 - Documentation: Full or Limited
 - Past delinquencies: Up to 120 days
 - LTV: 80%
 - Mortgage insurance: rarely over 80%
 - Credit subordination level: 15% - 20%
- Top issuers include: GSAMP, Ameriquest Mortgage, New Century, Lehman/SASCO, GMAC-RFC, Option One, CSFB/ABSC, Countrywide, Chase, First Franklin, WAMU, Novastart Mortgage, WMC Mortgage, Citigroup, and Household Financial.
- Note that 80% of these loans are hybrid fixed / floating, with two to three year fixed periods.
- A growing number of these loans are interest only.



Subprime - Performance

- Subprime loans are typically less rate sensitive than agency MBS. Prepayments are typically dependent on increases in collateral value (where borrowers then can take cash out by refinancing) and credit cure-ing.
- Subprime MBS typically have less negative convexity than agency MBS.
- Subprime loans create an opportunity to increase margins and returns since they have higher coupons; however, these loans do have riskier borrower credit performance than prime asset classes.
- There has been increasing regulatory pressure on sub-prime asset classes related to consumer protection laws, as well as increasing credit enhancement due to rating agencies revisiting their models.
 - Moody's changed their standard requirements in May of 2004,
 - S&P is expected to revise their standards in November 2004, and
 - Revisions from Fitch are expected at any time.
- Market color:
 - Sub-prime origination volume grew 50.8% from 2002 to 2003.
 - Debt consolidation will continue to expand.
 - A large part of the subprime market are borrowers new to the lending market, possibly coming from another country. As this demographic increases, the subprime market is expected to increase.



Alt – A - Characteristics

- Alt-A pools consist of mortgages that are between prime and subprime credit quality, or have other features that disqualify them from being classified as Prime.
- One way to look at Alt-A securities is by dividing them by:
 - Prime Alt-A: borrowers who are prime but missing documentation (self-employed, no employer references, etc.)
 - Non-prime Alt-A: strong subprime borrowers, sometimes called Alt-B
- Characteristics typical of Alt-A collateral are
 - FICO: 640 – 720
 - Documentation: limited
 - Past delinquencies: once in the past twelve months
 - LTV: 70% - 95%
 - Mortgage insurance: sometimes
 - Credit subordination level: 3% - 7%
- Top issuers include: GSAA, Countrywide, GMAC-RFC, IndyMac, Impac, CSFB, Lehman/SASCO, and Bear Stearns.



Alt – A - Performance

- Alt-A securities typically have slower CPR than MBS of jumbo prime collateral.
 - For Prime Alt-A, prepayments are typically slower than those of prime pools in the first year and mimic prime prepayments in later years.
 - Non-Prime Alt-A usually have prepayments similar to those of subprime initially, or slightly faster (since they do have better credit quality); then they speed up if their credit quality improves and the borrower can refinance at a prime rate.
- The Alt-A market usually has lower prepayment risk than a prime pool, and lower default risk than a subprime pool.
- In addition, the convexity of Alt-A securities is typically less negative than that of agency MBS because:
 - When yields are low, fewer borrowers refinance;
 - When yields are high, there is little refinancing incentive; and
 - While defaults are higher than Jumbo collateral, they are not near those of subprime collateral.
- Origination of Alt-A product has historically been counter-cyclical to movements in rates.



Alt- A - Market Color

- The Alt-A market has grown more than 243% since 2002 and this growth is expected to continue.
 - To maintain volume as refinancing declines, prime originators will expand downward in the credit spectrum while subprime originators will expand upward.
 - Originators are beginning to understand how to price Alt-A collateral more accurately.
 - The investor base has become more sophisticated in understanding the credit risk and higher coupon dynamics, and is now willing to pay more for these securities.
- The top four loan originators in the space represent 50% of the market (Countrywide, GMAC-RFC, IndyMac, and Impac).
- Currently, top sub-prime originators are actively developing Alt-A programs and underwriting guidelines.
 - New entrants include Ameriquest, New Century, and Fremont; Option One, Accredited and ABN Amro are expected to enter the market in 2004.
 - It is interesting to note that as sub-prime originators enter the Alt-A market, they will be originating loans closer to the prime market, which are increasingly more rate sensitive.



FHA/ VA Reperforming - Characteristics

- This collateral consists of loans that have been bought out of GNMA pools because of delinquency and sold into new pools once they are made to reperform.
 - Servicers may buy out any GNMA loan that is 90+ days delinquent, at par, from a pool.
 - Like traditional GNMA collateral, loans retain the insurance / guarantee by the FHA / VA.
- Characteristics typical of FHA / VA reperforming loans are:
 - FICO: 550 - 650
 - Documentation: limited
 - Past delinquencies: more than 90 days
 - LTV: 90% - 100%
 - Mortgage insurance: sometimes
 - Credit subordination level: 2.5% - 5.5%
- Top issuers include: CSFB, Lehman/SASCO, Countrywide, GMAC-RFC, IndyMac, Impac, Bear Stearns, Wells Fargo, WAMU, Chase, Countrywide, and National City.
- Most loans are fixed rate.
- The credit quality of these mortgages is usually equated to weaker-than-average subprime loans; however, with the FHA or VA insure or guarantee, these pools are considered similar to prime MBS.



FHA / VA Reperforming - Performance

- On these pools, the borrowers have showed a desire to pay (since they are made to reperform), even though they have a history of delinquencies.
 - It has been estimated that these pools will have higher default rates (before recoveries) than average subprime pools.
- Owing to credit impairment, these pools are typically less sensitive to refinancing.
 - Hence, the convexity of these pools is less negative than that of agency MBS.
- Prepayments can rise over time as the credit of the borrowers improves and they can refinance at lower rates.
- It is important to note that under stressful market conditions, the VA guarantee offers less coverage than the insurance of the FHA.
 - Hence, pools with a larger percentage of FHA loans require less credit engagement.



Scratch and Dent Loans - Characteristics

- Scratch and Dent loans are primarily made to borrowers with the lowest FICO scores and the most impaired.
 - They can also be loans that were originated outside of standard underwriting guidelines, i.e., they have higher than normally allowed LTV, lower FICO scores than the guidelines call for or document flaws.
 - This term can also refer to loans that missed a payment shortly after origination.
- These assets comprise approximately 5% of an originator's volume (on average).
- Characteristics of these loans include:
 - Program exceptions just beyond tolerance or non-perfectible documentation issues.
 - Early payment inconsistency (but cash-flowing).
 - Material program or document exception with severe payment inconsistency.
 - Negative equity and under performing.
- These assets are difficult to securitize as their characteristics exclude them from traditional lower credit quality securitization programs and because of their limited volume, it is often prohibitively expensive to aggregate them.



V. MBS Structures



MBS Structures

- Basic MBS Pass Thrus

- Agency MBS are initially issued in pass-through form.
 - In a pass-through security, the interest and principal payments of the underlying collateral are passed to the security investor, less a servicing fee.
 - Fixed FHLMC pass-through securities are called Gold PCs, and floating securities are called Arm PCs.
 - FNMA pass-thrus are referred to as Fannie Mae MBS.
- Securities are traded in either a To Be Announced (TBA) format or by specifying a particular characteristic or pool number.
 - TBA securities are the most liquid in the market, and are traded by coupon. The actual security that is delivered is determined by the seller on the settle date, hence the To Be Announced acronym.
 - A specific pool vintage, or issuance, of a security can also be traded, and usually trades at a premium to a TBA security of the same coupon.
- Structured products with various characteristics can then be created utilizing these pass-thrus.
- Non-agency collateral are called whole loans before they are securitized.
 - Pools of loans might be sold in the market in a whole loan bid, or securitized by the originator.
 - Pass-thrus can be created out of this collateral, in addition to more structured products.



MBS Structures

- Collateralized Mortgage Obligations (CMOs)

- CMOs are created by pooling mortgage pass-thrus or mortgage whole loans and splitting their cash flows into a number of tranches.
- A CMO is self-supporting, i.e. the collateral cash flow is able to meet the tranches' cash flow requirement.
- Tranches vary by:
 - Average life;
 - Coupon;
 - Stability;
 - Prepayment risk; and
 - Credit Rating.
- CMOs have a broad range of investors, because they are able to satisfy disparate investor's needs for cash flows with varying levels of average lives, coupons, and stability profiles.
 - Banks typically invest in securities with the shortest average life.
 - Money managers usually invest in intermediate average life securities.
 - Insurance companies generally favor securities with the longest average life.



CMO Characteristics

- There are agency and non-agency CMOs, just as there are agency and non-agency MBS.
 - Agency CMOs carry the same guarantee / insurance as agency MBS.
 - There is no need for credit enhancement in these structures owing to the agency guarantee / insurance; so tranching is used to create bonds of different average lives or performance characteristics.
 - CMOs created out of whole loans do not carry the agency guarantee / insurance and are structured to create credit enhancement in addition to different average lives and performance characteristics.
- Some examples of CMOs are:
 - Sequential pay classes;
 - Planned amortization classes (PAC);
 - Targeted amortization classes;
 - Support Classes;
 - Z bonds;
 - Accretion-direct classes;
 - Floaters and inverse floaters; and
 - Interest only / principal only.



CMO Structures



- “Vanilla” or Sequential Pay Classes

- The vanilla CMO creates tranches with sequential pay classes.
 - Cash flow from the underlying collateral (mortgages or MBS) is used to pay interest to all classes.
 - The first tranche, or the tranche with the shortest average life, receives all collateral principal payments (scheduled and prepayments) until the class is retired.
 - Then, all principal payments are used to pay down the second tranche, and so on until all bonds have been fully paid.
- The primary purpose of this structure is to create MBS with varying average lives and to redistribute prepayment risk.
 - The first tranche has the shortest average life, and each tranche remaining has a longer average life.



CMO Structures

- “Vanilla” or Sequential Pay Classes (Continued)

Pass Thrus	6.0%			
Size (\$MM)	500.0			
Average Life (Years)	5.4			
Price	100-12			
Yield (%)	5.91			
Dollar Duration	4.98			
Market Value (\$MM)	501.88			
				
Sequential CMO Deal	A 6.0%	B 6.0%	C 6.0%	D 6.0%
Size (\$MM)	125.0	125.0	125.0	125.0
Average Life (Years)	2.3	5.6	10.3	19.6
Price	102-14	103-00	100-08	95-26
Yield (%)	4.70	5.35	5.99	6.43
Dollar Duration	0.31	2.79	5.90	8.65
Market Value (\$MM)	128.05	128.75	125.31	119.77
				
	Total Value: 501.88			



CMO Structures

- “PAC” or Planned Amortization Classes

- PACs are a type of tranche in a CMO structure. They are designed to stabilize bonds because they can support a range of prepayment assumptions through a pre-determined schedule of payments.
- CMOs with these tranches:
 - First pay interest to all classes;
 - Next, allocate cash based on a pre-determined principal payment structure that relies on different prepayment speeds until the PACs are paid down.
 - Support tranches, called companion classes, support this payment schedule by either accepting prepayments, or paying out needed principal.



CMO Structures

- “PACs” (Continued)

- PAC IIs have been developed as the marketplace has become more sophisticated and sensitive to unexpected prepayments.
 - PAC IIs are generally protected by supports, but also act as protection for PACs.
 - This creates higher yielding bonds, that are more stable than companion classes.
- TACs, or targeted amortization classes, are similar to PACs in that they pay bondholders according to a schedule; however, they are insulated from a tighter range of prepayment speeds, usually a single speed.
 - If principal cash flow exceeds the scheduled payment to the TAC tranche, then support classes will absorb the extra cash flow; however, if cash flow falls below the level needed for the scheduled payment, the extra cash will not be produced, and the bond will extend.
 - Hence, they are insulated from call risk, but not from extension risk.
 - These bonds offer protection against the call option of prepayments, but with a higher yield than PACs since they do not have extension protection.



CMO Structures

- Z Bonds

- Z bonds are CMO classes that have the ability to pay their interest payments to another class while accreting in principal.
 - Z bonds will not receive principal until the bonds prior to it in the CMO cash waterfall have been retired.
 - Unlike other CMO classes, the Z bond will not pay interest to its bondholder while bonds prior to it in the waterfall are outstanding. Instead, its interest is used to pay down the principal of another bond in the structure (an accretion directed class). Simultaneously, the Z bond will add this amount to its principal balance, a process called accreting. Following is an example:
 - "GNR 04-81 Z" is a 5% Z-bond that directs interest to classes "VA" and "VB". While classes "E", "VA", and "VB" are outstanding, "Z" will not receive principal or interest. During this time, the Z bond's coupon of 5% will be used to pay down the principal balance of the VA/VB classes, while its own principal balance will increase by the 5%.
 - After the bonds prior to the Z bond in the waterfall have been paid off, the Z bond will receive principal and interest.
- Z bonds typically increase principal payments of the accretion-directed classes in the structure, hence shorting their average lives. The larger the Z bond in a CMO structure is, the shorter the lives of the accretion-directed classes are.
- An accreting Z bond will generally have a longer duration than a non-accreting bond with the same average life and similar structure (for the same mathematical reason a zero coupon treasury has a longer duration than a coupon-bearing treasury of the same maturity).



CMO Structures

- “VADM” or Very Accurately Defined Maturity Bonds

- VADM structures were created to limit extension risk if rates rise and prepayments slow down.
- In a VADM bond, payments are scheduled within a prepayment band; however, the range includes 0% PSA.
 - There generally is no extension risk and VADMs mature on their stated maturity date.
 - VADM structures are found only in CMOs with Z bonds. This is because all of their cash flows come from the period of lockout from the Z bond while the interest is creating accretion.
- If the Z bond is large enough to support a VADM class, then one will exist.
 - A VADM bond comes before the Z bond in the priority structure, but after the senior bonds and PACs in the cash flow waterfall.



CMO Structures

- Mortgage Derivatives

- “IO / PO” or interest only and principal only strips are a kind of mortgage derivative. Most other derivatives can be created from IOs and POs.
- In structuring collateral, payments can be “stripped” into interest cash flow streams and principal cash flow streams.
 - IO/PO strips can also be re-combined back into collateral.
 - The Price of IO + Price of PO = Price of Collateral and consequently, efficient market pricing mechanisms exist.
 - Note that this price enforcement does not usually exist in the REMIC market where CMOs regularly trade “behind creation.”
- Investors in IO/POs structures include:
 - Money managers, who usually buy IOs or POs to enhance portfolio performance.
 - Hedge funds, who often use IOs and POs to perform relative value trades, as well as express their own views on basis, carry, prepayments, and volatility.
 - Mortgage bankers, who typically buy POs to hedge servicing.
 - Insurance companies, who typically use IOs and synthetic premiums to enhance portfolio performance.
 - Commercial banks, who sometimes use IOs to manage overall portfolio duration and enhance returns in a higher rate environment.
 - Mortgage Agencies, who can use them to manage their portfolios.



CMO Structures

- IO / PO Characteristics

- When rates rise, prepayments generally decrease, which causes the bond to extend.
 - Generally, this will increase the value of the IO since there is more cash flow, and
 - Typically will decrease the value of the PO since POs are purchased at a discount to par and the par payment is now received further out in the future.
- When rates fall, prepayments typically increase, which causes the bond to shorten.
 - This generally decreases the value of the IO since there is less cash flow, and
 - Generally increases the value of the PO since cash is returned at par more quickly.
- Owing to this relationship, the duration and convexity of IO and PO bonds are typically as follows:

	Duration	Convexity
IO	Negative	Negative
PO	Positive	Positive
Pass-Through	Positive	Negative



CMO Structures

- Some Reasons to Trade IOs and POs

- IOs and POs can be used in carry trades.
- Rate of Return Hedge:
 - An investor can add an IO to a fixed income portfolio.
 - This can reduce the duration of the portfolio using the negative IO duration previously discussed. The reduced duration may help flatten out the portfolio's rate of return across different yield curve shifts.
- Synthetic Premiums:
 - An investor can generally boost the coupon of a TBA pass-through by adding an IO to it.
 - For example, by adding 100 bp of a 5.5% IO to a FNMA 5.0, a 6% pass-through is synthesized. This 6% synthetic premium may be cheaper than the FNMA 6.0.
- Combo Strategy:
 - An investor can buy an IO and a PO of different trusts.
 - For example, the investor can buy a 5.5% IO and a 5.0% PO. This indicates that the investor believes FNMA 5.5s will prepay slower than the market consensus, and FNMA 5.0s will prepay faster.



CMO Structures

- Mortgage Derivatives (Floaters/Inverse Floaters)

- In addition to separate interest and principal strips, it is also possible to have the coupon of an MBS float with an index.
- A fixed interest rate on a given tranche is proportionally allocated into a floating rate class and an inverse floating rate class such that together, the original interest coupon will stay the same.
 - The floating rate part of the class resets periodically (usually monthly) at a spread to LIBOR or other indices like CMT or COFI. The inverse floating rate class moves in the opposite direction to maintain the same combined fixed rate.
 - Caps and floors usually exist.
- There are numerous reasons to own floaters:
 - Their generally high credit rating (agency or AAA).
 - Usually attractive spreads (margin) versus funding costs.
 - Floaters are useful in a rising rate environment or in a flattening yield curve one.
 - There is considerable variety in the structure of CMO floaters.
- Floaters are usually priced at or close to par.
- Floaters are generally sold to achieve financing of an MBS (passthru or CMO) that:
 - Can be permanent; or
 - Can be superior to the repo market
- These derivatives are usually created from higher yielding collateral and structure to take advantage of the implicit leverage.



CMO Structures

- Mortgage Derivatives (Inverse Floaters)

- The inverse inherits the duration and convexity of the floater/inverse floater pair and are generally purchased because of this leverage.
- Therefore, you can consider an inverse a levered position of the underlying asset. An examples of how this can be used:
 - Suppose someone buys \$100m GN 7.0s, at a price of 106-24 by using \$6.75m of their own capital and by borrowing the other \$100m at Libor + 40bp (subject to a 7% cap). Their net income is 7% from the GN bond, minus the L + 40bps that they borrowed the \$100m at, or 6.6% - L.
 - The same borrower could also have bought a 6.6% - Libor inverse IO backed by a GN 7.0.
 - Note that in buying the IO directly, the buyer cannot use the roll market, however they do not have risks in obtaining financing at an attractive rate.



Agency vs. Non-Agency CMO Structures

- All of these structures can be created by using agency pass-thrus as collateral.
 - Triple-A securities are structured to create bonds of varying characteristics, e.g. average life.
- The diversity of non-agency collateral often limits the kinds of CMO structures that can be created.



Mortgage Options

- A standard mortgage option contract specifies
 - Collateral: Program, maturity and coupon.
 - Type: Call or put.
 - Strike price: Strikes are usually quoted relative to the standard forward settlement price as of the option expiry date.
 - Expiration date: The standard expiration date is seven business days before the standard settlement date during the month of option expiration. However, other expiry dates are possible.
 - If the option is exercised, the option holder/writer must accept/deliver TBA collateral.
- Mortgage options are usually short-term in nature and liquid, with average term to expiry of around two months (although they have reasonable liquidity up to six months).
- Mortgage options can assist with:
 - Managing portfolio duration, convexity and volatility.
 - Expressing views on relative value in mortgages versus other asset classes.
 - Taking advantage of implied mortgage volatility versus expected volatility.
- Large transaction volume is possible, and is often an important supply/demand factor in the pass-through market.



Mortgage Options

- Participants

- Mortgage Originators:
 - Are typically buyers of mortgage puts in order to protect their origination pipeline against rising rates.
 - Are typically buyers of calls to hedge potential fall-out risk (borrower or investor fails to close on the originated loan and it "falls out" of the pipeline).
- Banks:
 - Are typically sellers of calls to enhance portfolio yield which can usually be achieved through covered call writing.
- Money managers and hedge funds:
 - Usually buy and sell options to:
 - Attempt to adjust their portfolio duration and convexity.
 - In order to hedge mortgage and CMO holdings.
 - To make basis trades.
- Dealers:
 - Buy and sell options in order to try to be duration and convexity neutral.
 - As a proxy for purchasing the underlying collateral.



Mortgage Option Terms

- Delta is similar to duration; and is the fraction of bonds that are expected to be delivered into an option.
 - Delta's of calls range from 0 to 1, where a deeply out of the money call might have a delta close to zero, implying that there is almost no chance that it will be exercised, an at the money call might have a delta of .5, meaning that one bond is expected to be delivered for every two calls that are held, so it is equally likely to be exercised or not.
 - Delta's of puts range from 0 to -1, where a deeply in the money put might have a delta close to -1, since it will almost certainly be exercised.
- Gamma measures convexity of options; and is the change in delta for changes in the price of the underlying security.
- Vegas are volatility sensitivity;
 - Vega is the change in price for a specified change in volatility assumption.
 - Vegas are typically small, given the short-dated nature of mortgage options.
 - Vegas are generally higher for options on lower coupons owing to the longer duration of the collateral.
 - Vegas are usually the highest for at-the-money options.
- Theta is the change in the value of the option if all of the above stay constant, i.e. the change in option price owing to passage of time.
 - The theta of a long option is negative, since as the date of expiration approaches, the value of the option goes down.



VI. Commercial Mortgage-Backed Securities (CMBS)

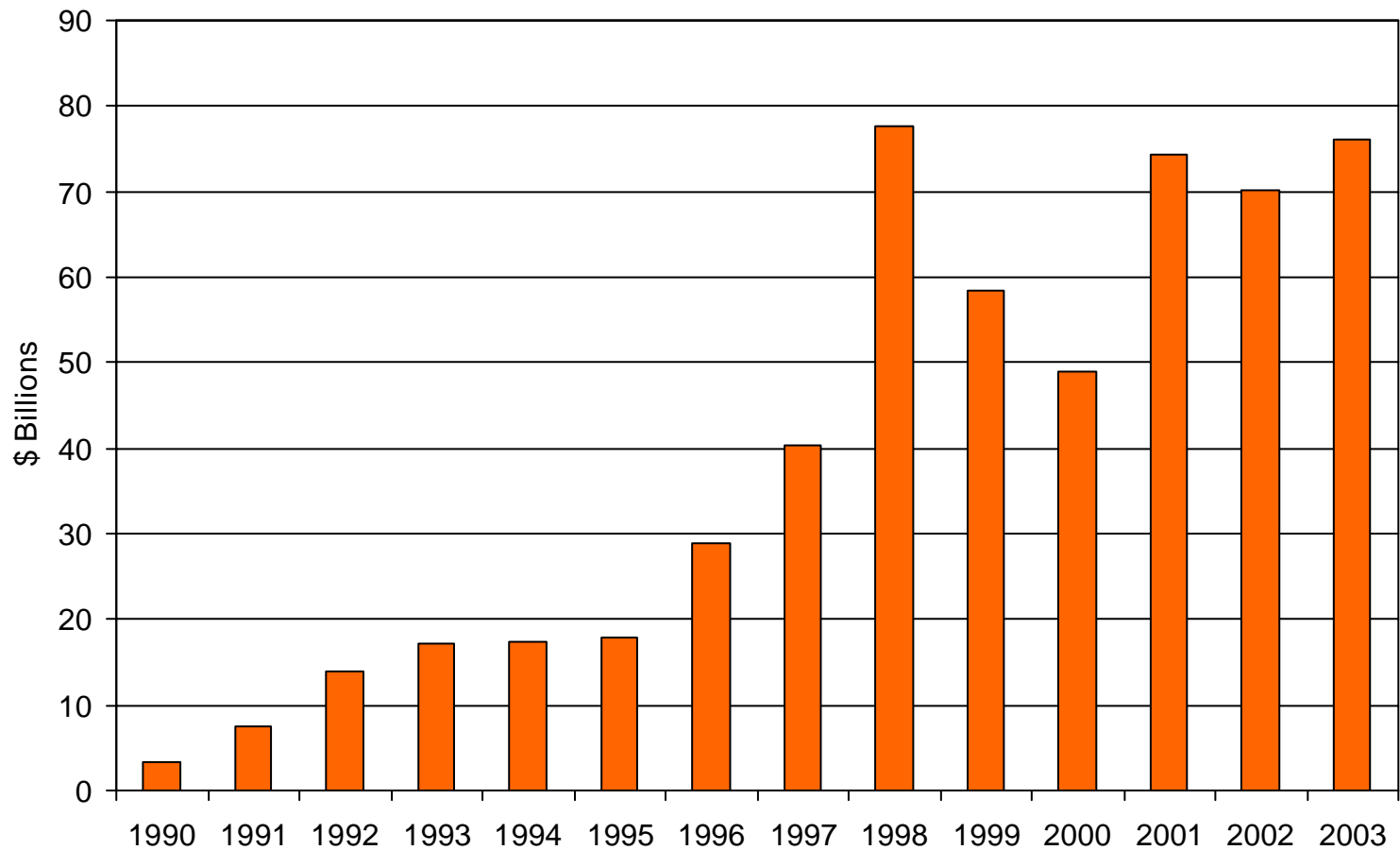


What Are CMBS?

- CMBS are securitizations of mortgages backed by commercial real estate.
 - Loans are typically secured by apartment buildings, shopping malls, warehouse facilities, hotels, office buildings, and other commercial properties.
 - Investors usually depend on the collateral for ultimate repayment.
- At the end of 2002, over \$330 billion CMBS were outstanding in the US. Currently, there is almost \$400 billion outstanding.
 - Approximately \$76 billion of CMBS were issued in 2003, which is an increase of 8.5% from 2002.
- CMBS can be issued with ratings across the entire credit spectrum.
 - Classes range from triple-A down to unrated.
 - Recently, 75% or more of each fixed rate deal is typically rated triple-A.
- Compared with residential mortgages, commercial mortgages:
 - Usually have larger loan amounts, ranging from \$2 million to over \$100 million.
 - Typically have payment schedules with seven- to ten-year terms, with 25- to 30-year amortization schedules (similar to balloon payments).
 - Prepayments are usually limited by lockouts and/or penalties, the main risk in these bonds is typically default, and not prepayment.
 - Credit of the loan is typically driven by the collateral (property), not by an individual's consumer credit.



Domestic New-Issue Volume



Source: Commercial Mortgage Alert and The 2004 Mortgage Market Statistical Annual



Types of CMBS

- Floating Rate Loans

- Borrowers requiring transitional or interim financing typically prefer floating rate loans. Reasons for transitional or interim financing include:
 - Property acquisitions.
 - Repositioning or renovating a property.
 - Generally short term (less than five-year loan maturity).
- Borrowers who think interest rates will drop also prefer floating rate loans.
- Borrowers who may want access to a prepayment option:
 - Can usually prepay after a 1 year lockout period.
 - Seek to maintain financial flexibility.
 - Expects to refinance after property value has been enhanced, stabilized or fully occupied.



Types of CMBS

- Fixed Rate Loans

- Fixed rate loans constitute the majority of CMBS originations to date.
 - Loans are typically made on existing properties with stable operations.
- There is general prepayment protection on recent deals because many contain prepayment options that are prohibitively expensive.
 - Interest rate sensitive prepayment is generally not a primary risk factor for investors in recent transactions due to penalties (mostly lockout / defeasance) and other factors.
 - Hence, the convexity of CMBS are more similar to that of corporate bonds, and does not have the typical MBS negative convexity.
- Borrowers usually need to refinance these transitional loans on the balloon date.
 - This introduces “balloon extension risk” that the borrower cannot obtain suitable refinancing at the maturity date.



CMBS Structures - Conduit Deals

- A conduit is a lending entity established to originate collateral for securitization.
 - Over 50% of fixed rate CMBS issuance is conduit-originated.
- A conduit typically creates a diversified collateral pool.
 - Most conduit deals are backed by a hundred or more loans.
 - Loan sizes typically range from \$1 million to \$25 million.
 - Most conduit deals have multiple borrowers, multiple property types, and multiple locations.



CMBS Structures - Fusion Deals

- A fusion deal is a combination of a conduit deal with some large loan collateral.
 - Pool size typically ranges from \$1.5 billion to over \$4 billion.
 - Often defined as a deal where the top 10 loans make up more than 50% of the entire deal.
- There seems to have been a resurgence of fusion deals in recent years:
 - The events of September 11, 2001, led to investor concerns over single-asset CMBS transactions (i.e., large loan deals).
 - As a result, fusion deals have become more frequent, as these deals contain large loans, but typically have less concentration risk than large loan / single-asset transactions.



Credit Enhancement

- In CMBS, the senior / subordinate credit enhancement structure is typically most common.
 - Subordinate classes provide credit support for senior classes.
 - Usually the entire cash flow from the underlying collateral pool supports the senior classes until they are retired. This is because principal is allocated in a top down waterfall structure (sequential pay).
 - Each class typically has specified priority as to when it receives cash flows.
 - Senior securities usually receive scheduled principal and interest (P&I) first.
 - Remaining classes are then generally paid with remaining cash, in the stated order of priority.
 - Losses are typically first applied to the principal balance of all junior securities, hence helping to insulate senior classes from initial losses.
- The amount of junior bonds required (subordination levels) is usually determined in conjunction with the rating agencies and the security issuers.
 - Higher quality and more diverse collateral typically require lower credit support levels.
 - Usually two or more rating agencies evaluate each transaction.



Credit Enhancement - Subordination Terminology

- Senior bonds are almost always rated triple-A.
- Mezzanine bonds are investment grade, but subordinate to senior bonds.
- Junior bonds (or B-pieces) are usually rated below investment grade and generally are exposed to the real estate risk of the underlying collateral pool.
- The first loss piece is usually the most junior class. Any significant loss on the collateral pool is most likely to eliminate this first loss piece.



Prepayments

- CMBS typically use CPR, as MBS do, to measure prepayments.
- Unlike agency MBS, defaults are not treated as prepayments.
- However, fixed rate CMBS today generally have prepayment protection from loan-level features:
 - Prepayment lockout: Loan covenant that prohibits prepayment for a specified period.
 - Defeasance: To prepay loan, the borrower must pledge non-callable Treasuries replicating the loan's scheduled cash flows. It is interesting to note that the credit quality of the CMBS is usually improved by loan defeasance since the collateral is replaced by Treasuries.
 - Defeasance, combined with initial lockout, is now the predominant form of loan-level prepayment protection.
 - Yield maintenance: The borrower pays a "make-whole" charge upon prepaying the loan, calculated as the present value of lost yield the investor would experience if all prepaid funds were reinvested in Treasuries.
 - This penalty is usually defined as the greater of 1% of loan balance or the present value calculation above.
 - Percentage prepayment penalties: The borrower must pay an additional fraction of outstanding balance when the loan is prepaid. Penalties generally decline over time.



Valuation

- Credit Analysis

- In order to evaluate the credit of a CMBS, the collateral is evaluated. These pools have fewer loans with a much larger balance than that of the typical MBS; therefore each loan may be evaluated individually, rather than using weighted averages.
- For each loan, the following are usually considered:
 - Loan underwriting standards:
 - Debt service coverage;
 - Leverage;
 - Property quality and stability; and
 - Due diligence: Appraisals, engineering, environmental and seismic reviews.
 - Legal structure and covenants



Valuation

- Credit Analysis (Continued)

- In particular types of deals, other credit factors also are usually evaluated:
 - Multi asset / multi borrower deals can also provide diversification in:
 - Geography.
 - Property types: Multi-family, retail, office, industrial, self storage, manufactured housing parks, lodging, health care.
 - Loan size: Smaller average loan size creates more diversity, and less impact if a single loan goes bankrupt.
 - Borrowers: Good credit histories/sponsorship.



Valuation

- Loan Underwriting Standards

- The debt service coverage ratio (DSCR) is the ratio of current net operating income (NOI) to current debt service.
 - This is sometimes thought to be the primary indicator of the likelihood of default. A higher DSCR usually indicates a greater ability to make debt service payments.
- The loan-to-value ratio (LTV) measures property leverage and is the ratio of loan principal amount to appraised property value.
 - With a lower LTV, if the property does default, it can usually be sold to recover most of the outstanding principal.
- Cash management, escrows, and insurance are usually also taken into consideration when underwriting a commercial real estate loan.



Valuation

- Local Market Analysis

- The local market environment is usually a factor to examine in determining CMBS default risk.
 - Economic history and characteristics:
 - Growth in population, income, and employment;
 - Key local business drivers;
 - Diversity of local market; and
 - Access to transportation and municipal services.
 - Rental and vacancy information.
 - Construction projects planned or in progress.
 - Political and legal environment:
 - Zoning and other regulations;
 - Environmental issues; and
 - Taxation.



Valuation

- Role of the Rating Agencies

- The rating agencies determine minimum levels of credit support in to create bonds of desired credit rating typically by:
 - Reviewing loan documentation and agreements.
 - Inspecting the properties.
 - Evaluating the transaction's legal structure.
 - Assessing underwriting standards such as:
 - Sustainable cash flow to support debt service;
 - Property valuation and leverage; and
 - Likelihood of default and anticipated severity of loss.
- The rating agencies may conduct surveillance of rated transactions in order to see how they are performing and to assist in ratings on future transactions.
- The agencies may conduct periodic rating affirmations or revisions based on the actual performance of certain securities.
- In a recent trend, required subordination levels have decreased because of generally stronger underwriting and issuer emphasis on standard property types.



VII. Asset-Backed Securities (ABS)



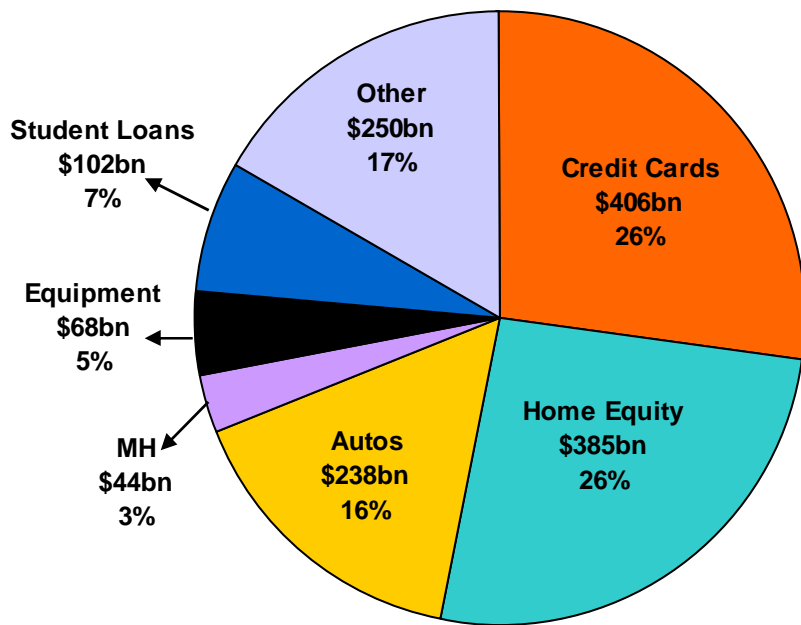
What Is an Asset-Backed Security (ABS)?

- Similar to an MBS, an ABS is a collection of a type of asset (e.g. auto, student, credit card) combined into a group and evaluated using weighted average characteristics (WAC, WAM, WALA).
 - To date, credit card, auto, home equity, equipment, stranded costs, and student loans have been used as collateral in the majority of ABS transactions.
 - In an ABS, the bond partially derives its creditworthiness from this pool of underlying collateral.
- While the market is primarily comprised of triple-A securities, single-A and triple-B bonds account for about 10-15% of issuance.
- GS estimates that approximately 75% of the market is floating rate.
- ABS and MBS capitalize on securitizations in similar ways. Some further reasons to securitize assets other than mortgages include:
 - Generally low prepayment risk relative to MBS.
 - Typically high liquidity, especially in benchmark issuers.
 - Structuring technology allows variety of credit, liquidity and prepayment risk profiles.
 - Spread curve (with respect to average life) is generally upward-sloping.



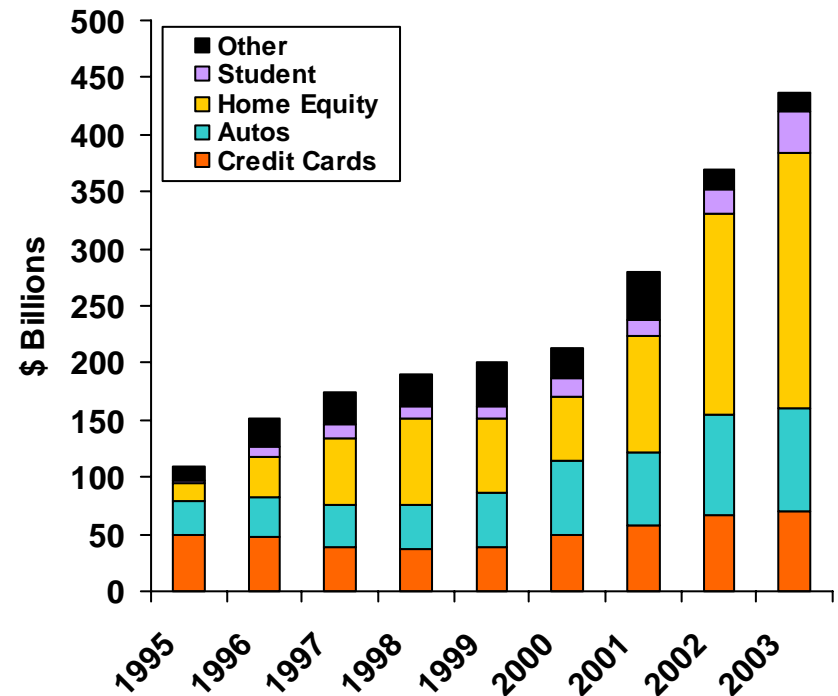
The ABS Market

- The ABS market represents 8% (\$1.7 trillion) of the \$22.1 trillion public US fixed income market.
- The largest parts of the ABS market are securitized credit card and home equity loans.



Total: \$1,749 Billion

ABS Issuance by Asset Type

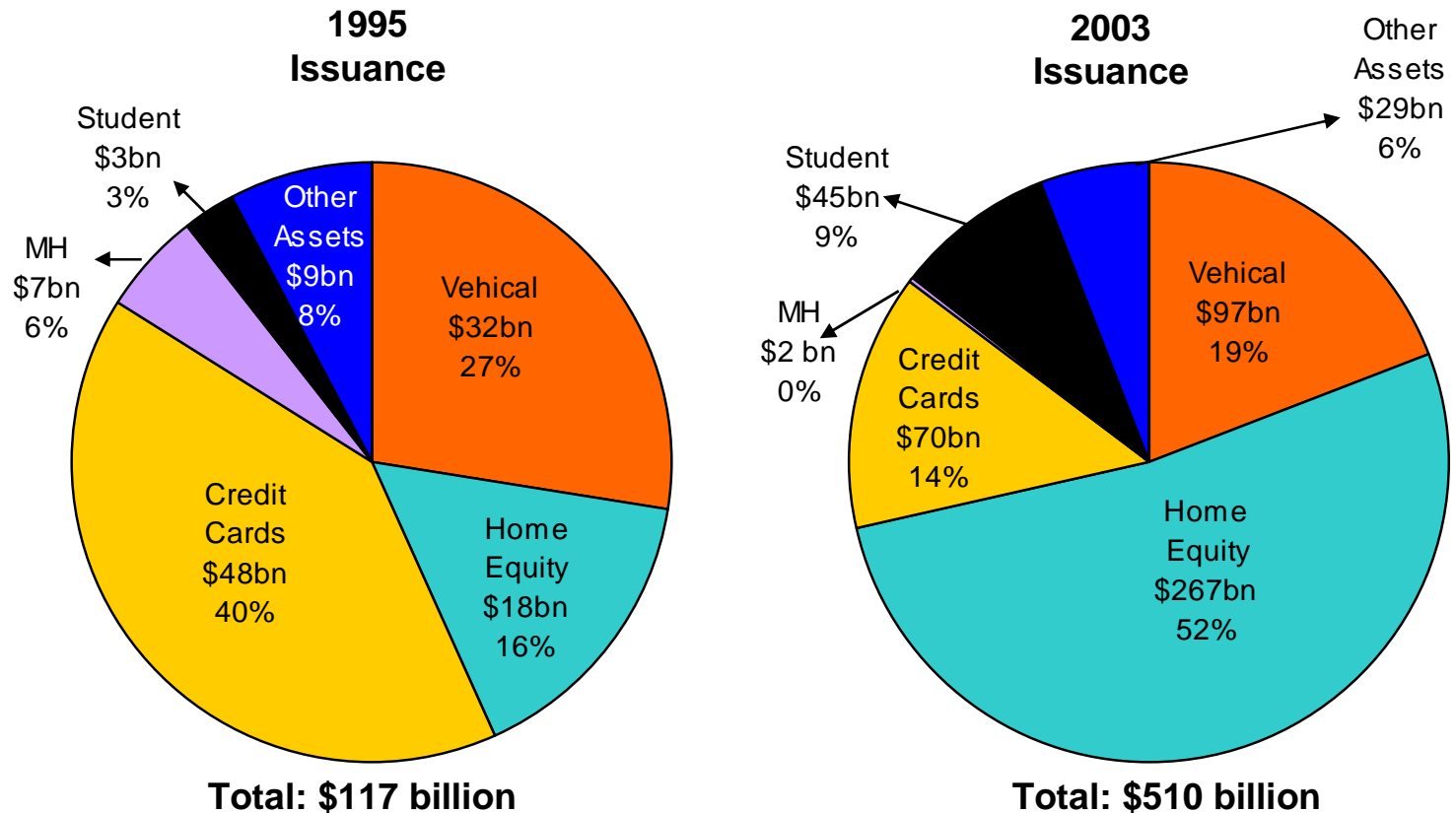


Source: Inside MBS & ABS



The ABS Market - Issuance Categories

- The types of assets being securitized have changed over the past 10 years, shifting away from autos and toward home equity.



Source: Inside MBA&ABS



The ABS Market - Volume of Issuance in 2003

Top 10 Non-Mortgage ABS Issuers in 2003
(in millions)

Rank	Issuer	2003 Volume	2003 Deals
1	Sallie Mae	\$25,700	16
2	Citibank	\$18,482	30
3	Ford Credit	\$13,299	4
4	JP Morgan Chase	\$12,500	9
5	GM/CARAT	\$12,293	8
6	Capital One	\$11,434	23
7	Bank One	\$11,174	18
8	MBNA	\$10,025	24
9	Honda	\$7,888	5
10	Nissan	\$7,247	5

Top 10 Non-Mortgage ABS Underwriters in 2003
(in millions)

Rank	Issuer	2003 Volume	2003 Deals
1	JP Morgan Chase	\$27,831	18
2	Citigroup/Salomon	\$27,192	93
3	Deutsche Bank	\$20,125	68
4	Banc One	\$18,643	91
5	Banc of America	\$16,889	15
6	Morgan Stanley	\$16,041	123
7	CSFB	\$15,750	69
8	Merrill Lynch	\$14,572	87
9	Lehman Brothers	\$14,313	9
10	Barclay's	\$12,200	95

Source: Inside MBS & ABS



The ABS Market

- Fixed and Floating Securities

- Prior to the mid-1990's, many more fixed securities were issued, however floating rate deals are now predominant.
- The rise in floating rate issuance generally reflects the following:
 - Enhanced securitization technology;
 - Expanded asset classes;
 - Modified regulations, allowing credit card rates to float;
 - Generally improved liquidity in the swaps market, allowing issuers to arbitrage relative value between fixed and floating rate issuance; and
 - Greater acceptance by global investors of floating rate ABS.



The ABS Market - Spreads

- ABS generally trade at different spreads (to different indexes) depending on the type of asset. Student loans typically trade with the tightest spread. Other assets usually trade, in order of tightest to widest spread as follows:
 - Student Loans
 - Credit Cards
 - Autos
 - Equipment
 - Home Equity
 - Manufactured Housing



Structure

- ABS are defined not only by the assets that are the collateral behind the bonds, but by their payment structures. Some of these structures are similar to those of MBS:
 - Amortizing:
 - The bonds are modeled similar to the amortizing schedule of the underlying assets, but prepayments can change the schedule, as with MBS.
 - When amortizing is used to securitize revolving assets, such as credit card loans, there is generally first an initial period of interest only while the amount of receivables are growing; then payments are made along a schedule created to return principal to the investor by the maturity date.
 - Bullet: Return principal to investors in one payment at the maturity of the bond, while interest is paid out in scheduled payments.
 - This structure is mostly used with revolving assets.
 - There is a period where principal collected by the assets is used to purchase more receivables and then a period similar to the amortization above where the principal is kept in escrow for the investors until the date determined.
 - In a soft bullet, the full payment is not guaranteed at the maturity date if enough principal has not been collected, and the remaining balance is typically paid out over the next 1-3 years.
 - In a hard bullet, the full principal must be paid at the maturity date.



Structure (Continued)

- Two additional ABS structures are described below:
 - Sequential: Typically, after all interest payments have been made, principal is first paid to investors holding the first tranche of the security, and then the second, etc.
 - This is generally used as credit enhancement in a senior / subordinate structure.
 - Pro Rata: After all interest payments have been made, all classes receive principal payments weighted by the amount outstanding in each class.
 - Each month, principal is usually first paid to the classes with the shortest average lives, but only in the scheduled amount.



Structure

- Tax / Trust

- The collateral of ABS are placed in a trust, which then issues securities.
 - Issuers such as banks are generally not subject to the bankruptcy code, so assets generally are transferred into a trust.
 - Other issuers that are subject to the bankruptcy code transfer the collateral into bankruptcy-remote special purpose corporations (SPC), which then transfer the assets into a trust.
- ABS can be offered publicly or privately. For tax purposes, securities are classified as either debt (notes) or undivided interests of the trust (certificates).
- There are different kinds of trusts that have different characteristics and benefits.
 - Grantor trust:
 - Pro rata pass-through structure, typically used for fixed pools of amortizing assets.
 - Generally prohibits active management of cash flows.
 - Owner trust:
 - Generally enables more flexible management of cash flows.
 - Transactions can be tranced (by time and credit) and targeted to specific investors.
 - Assets that use this include retail autos, equipment, and student loans.



Structure

- Tax / Trust (Continued)

- REMIC:
 - A tax structure specifically designed for real-estate assets.
 - Used for Manufactured housing, home equity ABS.
- Master Trust:
 - Typically allows for prefunding and tranching (time and credit).
 - Generally used to achieve term funding for relatively short assets.
 - It is a revolving trust that can issue multiple series of securities supported by a single larger pool of assets that can create more principal balance while in the trust.
 - If there is a reduction in the trust's net portfolio yield, then early amortization occurs (this is where principal is repaid as it is received, not according to scheduled payments).
 - Credit cards, wholesale auto, home equity lines of credit, and commercial ABS are usually created from the Master Trust.
- FASIT:
 - Approved by Congress in 1996, created a common securitization vehicle for all financial assets (intent similar to REMIC).
 - Securitizes equipment, commercial loans.



Home Equity Loans

- Home equity loans account for approximately half of ABS new issuance. Typical characteristics of home equity ABS include:
 - Collateral: First and second lien mortgages, closed end and lines of credit.
 - Structure: Fixed or floating, amortizing, REMIC trusts, sequentials, senior/sub.
 - Losses: Recoveries and losses generally depend on lien status.
 - Prepayments: Somewhat sensitive to changes in interest rates.
 - Credit enhancement: Subordination, over-collateralization, excess spread, and reserve accounts.
 - Typical Issuers: RFC, Countrywide, Chase, Long Beach.



Credit Cards

- Credit cards are still the largest sector of outstanding ABS and until recently, was the largest issued asset. Typical characteristics include:
 - Collateral: Revolving pool of individual credit card accounts.
 - Structure: Fixed or floating, soft bullet, senior/sub.
 - Losses: Usually driven by individual borrower bankruptcies.
 - Prepayments: Typically risk only matters only during amortization period.
 - Trade: Spread to swaps or discount margin.
 - Credit enhancement: Early amortization, subordination, reserve fund, overcollateralization.
 - Typical Issuers: American Express, Citibank, Chase, Capital One, MBNA.
 - Yield:
 - APR: The annual percentage rate that is paid by borrowers on revolving credit. 70-80% of portfolios are floating rate.
 - Interchange: Income from the card associations (Visa, MasterCard, Novus, etc) that is paid to the issuing bank as compensation for taking credit risk and funding receivables. Usually 2% annually.
 - Fees: Various late fees, annual fees, etc. that are charged to borrowers and collected by the trustee. Usually 2%.



Retail Auto Loans

- Retail auto loans were the first major sector of the ABS market. Typical characteristics include:
 - Collateral: Three major sectors:
 - Retail: Typically three- to seven-year fully amortizing level pay loans made to individuals. Majority of loans in the market.
 - Wholesale (Floorplan): Revolving loans made to dealers to finance their inventories.
 - Lease: Generally two- to five-year leases made to individuals.
 - Structure: Fixed or floating, amortizing, owner trust, sequential pay, senior/sub.
 - Losses: Generally low default rates, with moderate recovery values.
 - Prepayments: Generally predictable and driven by defaults, new car purchases (trade-ins), accidents.
 - Auto prepayments tend to be uncorrelated with interest rate changes.
 - Prepayments in Auto ABS are measured using ABS, the monthly rate of loan prepayments as a percentage of the original pool balance.
 - Trade: Generally wide to credit cards; spread to swaps or discount margin.
 - Credit enhancement: Subordination, reserve funds, surety bonds, excess spread, over-collateralization.
 - Typical Issuers: Daimler Chrysler, Ford, GM, Toyota, Honda, AmeriCredit



Retail Auto Loans - Market Color

- Prime auto finance is a relatively mature market, with generally tight margins and standardized pricing.
- Subprime auto finance is typically more diverse in asset quality, with general collateral pricing based on borrower credit and the extended product (e.g. term, LTV).
- Auto loans are typically three to seven years in length with fixed rates.
- Performance of prime auto loans is generally predictable.
- Performance of subprime auto loans generally vary depending on borrower credit and product type.



Student Loans

- Student loans are probably the most secure asset-backed type. Typical characteristics include:
 - Collateral: Loans to fund higher education, generally guaranteed up to 98% by the US government.
 - Structure: Senior/sub, three-month T-bill and LIBOR floaters, sequentials.
 - Losses: Usually peak one year after repayment begins.
 - Prepayments: Measured in CPR; 7% or 9% is the general market convention.
 - Trade: Spread to swaps or discount margin, generally tighter than credit cards.
 - Credit enhancement: Subordination, over-collateralization, excess spread, and reserve accounts.
 - Typical Issuers: Sallie Mae, CLC, Neltnet, KeyCorp.



Student Loans (Continued)

- Types of student loans include:
 - FFELP (Federal Family Education Loan Program): Largest proportion of student loans outstanding.
 - Loans to students or to parents of dependent students that are 98% guaranteed by a state-designated guarantor.
 - Reinsured by the US Department of Education (DOE).
 - Defined under Title IV of the Higher Education Act (HEA).
 - Private Loans: credit underwritten and not guaranteed by the DOE; hence they generally have protection against default only through the guaranty of private companies or from credit enhancement in the securitization.
 - Usually have significant cash reserves.
 - Direct Loans: Funded directly by the government to the student.
- Prepayments: Note that there is typically no penalty for prepayments. Typical prepayment speeds are:
 - FFELP: 7-9% CPR;
 - Consolidated: 4% CPR (or a ramp); and
 - Private: 7% CPR.



Student Loans - Market Color

- Volume has increased because:
 - Low interest rates have typically driven student loan debt consolidation,
 - The cost of education has generally continued to rise, and
 - The number of students taking out loans has increased.
- Spreads have been generally tightening, especially for longer-dated and subordinated paper as investor acceptance of this collateral has generally increased.



Equipment Loans and Leases

- Equipment loans and leases are made on a wide range of assets, from trucks to copiers, large businesses to small businesses, agriculture to construction. Typical characteristics include:
 - Collateral: Loans and leases to usually finance purchase of small, medium-sized, or heavy equipment.
 - Structure: Fixed or floating, senior/sub, reserve fund, sequential.
 - Losses: Typically bankruptcy of obligor.
 - Prepayments: Usually measured in CPR.
 - Trade: Spread to swaps or discount margin, generally wider than autos.
 - Credit enhancement: Subordination, over-collateralization, and reserve accounts.
 - Typical Issuers: Caterpillar, Case, CIT.



Other Asset Types

- Manufactured housing
 - Used to be an active sector
 - Sector suffered generally owing to defaults and originator bankruptcies
- Franchise receivables
 - Loans to franchise operators for financing their operations
 - Restaurants, convenience stores
- Aircraft finance
 - Leases on commercial aircrafts
- Dealer floorplan
 - Loans to dealers to finance inventory (cars, boats, etc.)
- Small business loans
 - Loans to finance small businesses
 - SBA
- Collateralized bond/loan obligations
 - Arbitrage transactions involving secondary market purchase of securities
 - Banks and specialized managers
- Insurance premium receivables
 - Loans to commercial borrowers to finance insurance premiums
- Utility deregulation (rate reduction)
- Recreational vehicles and boats
- Tobacco litigation
- Healthcare receivables
- Mutual fund fees
- Royalty bonds



Credit Enhancement

- Similar to non-agency MBS, ABS are not generally guaranteed by a government agency; hence they typically require credit enhancement to achieve a triple-A rating.
- The type of credit enhancement used in a security is generally selected by the issuer.
- The size of enhancement is usually determined by the rating agencies.
 - Rating agencies usually take the approach that, subject to a worst-case scenario, credit enhancement should be sufficient to enable timely payment of interest and ultimate payment of principal before a specified legal, stated, or rated final maturity.



Credit Enhancement (Continued)

- Four types of credit enhancement include:
 - Subordination: Credit exposure is generally tranching into senior, mezzanine, and subordinate bonds.
 - Reserve Account/Cash Control Account (CCA): Initial cash deposit from the seller generally provides liquidity. Excess spread may be captured when increasing the reserve account.
 - CCAs are similar to a fully funded letter of credit.
 - Surety Bond: Insurance policy usually provided by a monoline insurance company. Monoline-enhanced transactions are frequently limited to new assets or "story" credits.
 - FSA, MBIA, AMBAC, and FGIC are typical surety providers.
 - In 1Q2004, these agencies insured 6.63% of new issuance.
 - Letter of Credit (LOC): Supplied by a triple-A rated bank. Rarely used now.
- Credit enhancement is provided by LOCs; corporate guarantees and wrap guarantees are less often issued since they introduce third-party event risk.



Credit Enhancement - Subordinated Tranches

- Securities rated lower than triple-A are generally accounting for a greater share of total market activity.
 - They have typically higher levels of risk tolerance as the market seasons.
 - There have been some initiatives to broaden the distribution of these securities.
- Approximation of typical subordination by sector:

— Subprime home equities	20-30%
— Prime credit cards	15-25%
— Prime autos	6-8%
— Student loans	3-6%
- Subordinate spreads tightened in 2003 and early 2004, that could reflect:
 - Improving credit environment;
 - Increasing investor comfort; and
 - Increasing investor appetite for credit risk.
- Liquidity is typically weaker in subordinate ABS, reflecting reduced issuance volumes.



Prepayments

- As with MBS, prepayments are a key factor in determining the value of ABS. In some structures, this extra cash flow is placed in an account and used as further credit enhancement. Below, the different methods of measuring ABS prepayments are outlined:
 - ABS: Expresses a flat monthly prepayment rate as a percentage of the pool size (auto loans).
 - CPR: Expresses prepayments as a function of the declining amount of outstanding loans and is always given as a compound annual rate (home equity loans, equipment loans, and student loans).
 - MHP: Based on a ramp beginning with 3.7% CPR (for a new loan) and growing to nearly 6% CPR over a 24-month period (manufactured housing loans).
 - HEP (home equity prepayment rate): Ten-month evenly increasing seasoning ramp, ranging from 0% to 100% CPR (home equity loans). Similar to PSA, HEP can be expressed in a percentage. For example, 40% HEP corresponds to 4% prepayments in month 1, 8% in month 2, etc..., until reaching 40% in month 10, and remaining at 40% thereafter.
 - PPC (prospectus prepayment curve): Prepayment ramp specifically stated in the prospectus (home equity loans).



VIII. Collateralized Debt Obligations (CDOs) / Collateralized Loan Obligations (CLOs)



What Is a CDO?

- A collateralized debt obligation is a securitization of a pool of leveraged loans, structured product securities, or other financial collateral.
- The CDO issuer typically is a bankruptcy-remote special purpose vehicle that:
 - Issues various classes of rated term debt (with ratings ranging from triple-A to non-investment grade) and un-rated equity in the capital markets.
 - Uses the proceeds of this issuance to finance the purchase of a diversified collateral portfolio consisting of bank loans, structured product securities or other collateral.
 - Uses cash flows generated by the collateral portfolio to cover expenses, pay down the debt and accrued interest of the issued security, and make distributions to the equity portion of the CDO.
- In simple terms, the CDO issuer borrows money in the capital markets and then attempts to invest the money at higher spreads in the applicable asset market.
 - The difference between the after-default yield on the collateral and the funding cost of the liabilities and other expenses is usually captured by the equity class.
- An experienced investment professional, the collateral manager, actively manages the CDO's collateral portfolio.
 - The collateral manager selects the initial collateral portfolio and continues to manage it during a reinvestment period.
 - The collateral manager seeks to generate high risk-adjusted returns through his/her research, market knowledge, and trading ability, and it is usually paid fees for performing his/her duties.



What Is a CDO? (Continued)

- A successful CDO serves the objectives of three constituencies: debt investors, equity investors, and the collateral manager.
- Debt investors typically gain exposure to the applicable asset class that they would not have been able to achieve otherwise because of risk or minimum amounts.
 - By dividing its capital structure into different tranches, a wide variety of investors can become involved.
 - Investors in CDO debt typically earn attractive yields compared with similarly rated structured finance paper.
- Equity investors can gain leveraged exposure to the applicable asset class via non-recourse term financing.
 - Equity investors seek to capitalize on the potential arbitrage between the after-default yield on the underlying portfolio and the financing cost of the liability tranches.
 - The debt classes basically provide the equity with term financing.
 - The liability financing is non-recourse, meaning that equity investors are not exposed to losses greater than their invested amount.
 - The equity tranche can provide investors with high current cash flows without using alternative investments such as private equity or venture capital.
- The collateral manager usually secures an asset management mandate for a long term, earns fee income, and increases assets under management.



The CDO Market

- Issuers and Investors

- It is typically difficult for first-time managers to enter this market.
- Large institutional investment managers and more specialized boutique managers dominate the landscape.
- Investors generally are focusing on building thorough, multi-sector relationships with a few managers rather than making numerous one-off investments.
- Investor types vary across the capital structure:
 - Money market accounts, CP conduits, reinsurers, and non-US insurers are the main senior class investors; these buyers typically seek incremental spread versus alternative triple-A investments.
 - Structured vehicles (SIVs, CDOs, etc.), banks, insurers, and money managers are the main buyers of senior mezzanine (i.e. double- and single-A) classes.
 - Subordinated debt and equity CDO buyers tend to be dominated by hedge funds and non-U.S. investors who seek professional exposure to U.S. credit risk, and the right amount of leverage to the asset class.



CDO Structure

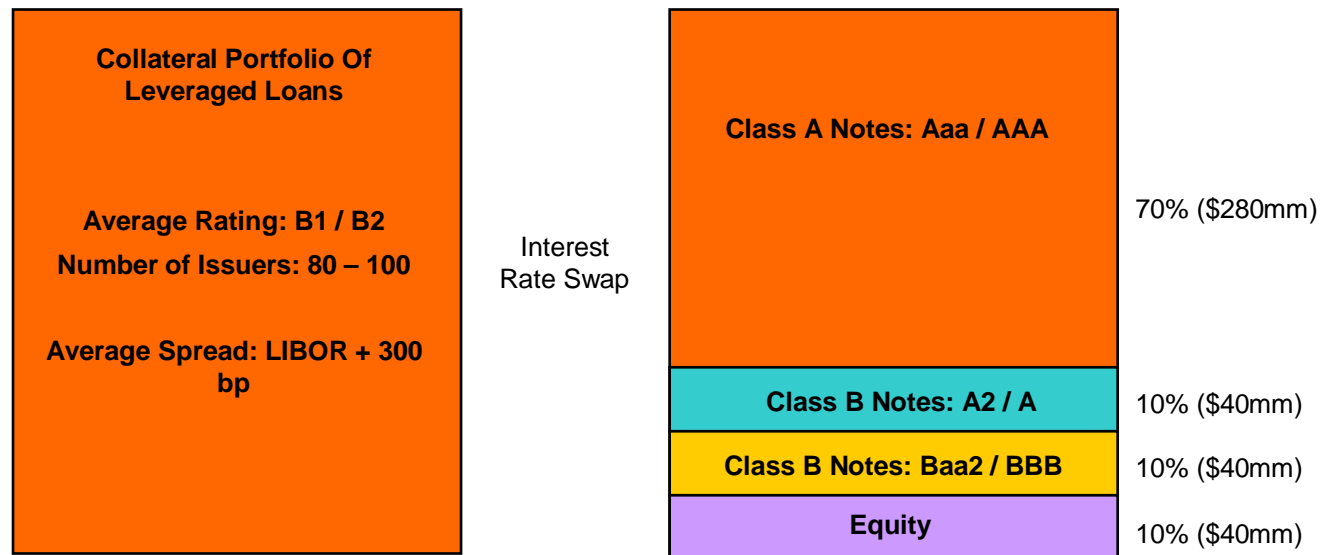
- A CDO typically has several distinct stages in its lifecycle.
 - Pre-closing: Period during which collateral is purchased by the collateral manager into a warehouse facility.
 - Pricing date: Date on which liabilities are priced and liability coupons / spreads are set for the life of the CDO.
 - Closing date: Date on which liabilities and equity sales are settled with investors and collateral portfolio is purchased by the CDO from a warehouse facility.
 - Effective date: Date on which collateral portfolio is fully ramped up and coverage / quality tests are passed.
 - Reinvestment period: Usually a three-to-five-year period after closing during which the collateral manager actively manages the portfolio, reinvesting principal proceeds from collateral amortization or sales in new collateral.
 - Non-call period: Usually a three-year or five-year period during which the CDO may not be called. After the non-call period, holders of the equity tranche have limited ability to make the issuer liquidate the collateral portfolio, pay off all liabilities and expenses, and pay any residual cash to the equity.
 - Post reinvestment period: The period after the reinvestment period during which principal proceeds from the collateral are used to pay down the principal balance of the CDO liabilities, typically in sequential order.
 - Maturity: Legal final date, typically twelve-to-thirty five years after closing, on which all collateral must have amortized or must be liquidated, with the proceeds used to pay down the liabilities with the excess distributed to equity.



CDO Structure

- Balance Sheet

- A CDO's balance sheet typically has three parts:
 - Assets: A portfolio of leveraged loans, structured product securities, interest rate swaps or caps, or other financial assets.
 - Liabilities: Term debt tranches (typically in the form of floating rate notes) that vary in seniority, rating, coupon, and average life. Also can include the fixed fee of an interest rate swap.
 - Equity: A junior tranche, which is typically in the form of preference shares or subordinated notes.
- Balance sheet for a hypothetical \$400 million CDO backed by a portfolio of leveraged loans might look like the diagram below.



Source: Goldman, Sachs & Co.



CDO Structure

- Rating Agency Methodology

- In rating CDO debt tranches, the rating agencies generally analyze the risks in the collateral portfolio to determine whether collateral cash flows are adequate to pay interest and principal on the rated debt.
 - The rating agencies typically analyze historical data (specifically default probability, default correlation, default severity, prepayment and extension scenarios).
 - The agencies usually do not base analysis for a cash flow CDO on the market value of the collateral portfolio.
 - Using historical data, the agencies generally project collateral cash flows for the CDO, based on the credit profile of the CDO portfolio.
- In order to achieve high ratings on its liabilities and thereby create an efficient financing structure, among other things, a CDO usually:
 - Creates sufficient structural subordination for more senior tranches;
 - Prioritizes the application of cash flows generated by the collateral portfolio so that senior tranches are served before subordinate tranches;
 - Corrects failures of par value coverage and interest coverage test levels by diverting the application of cash flows; and
 - Invests in collateral that meets credit quality, diversification, and other criteria.



CDO Structure

- Coverage Tests

- Coverage tests are meant to ensure that sufficient collateralization or interest coverage levels are maintained to protect a CDO's rated debt tranches.
 - Coverage tests generally consist of par value tests (or collateralization tests) and interest coverage tests.
 - A par value test typically seeks to maintain a minimum ratio of collateral portfolio amount to the par amount of CDO debt tranches.
 - For example, in a Class A, collateral par value / par amount of the Class A notes $\geq X\%$ (the par value coverage test ratio).
 - An interest coverage test typically seeks to govern the ratio of interest proceeds from the collateral portfolio to the coupon payable on CLO debt tranches.
 - For example projected interest proceeds generated by the portfolio / coupon due on the Class A notes $\geq Z\%$ (the interest coverage test ratio).
- If a par value test or interest coverage test fails (usually because of credit losses on the collateral portfolio), on a payment date, cash flow is diverted in the priority of payments to pay down the principal balance of the debt tranches (typically sequentially) until the minimum required test level is restored.
 - Such a diversion of cash flow can interrupt the payment of timely interest on subordinate debt tranches or the payment of distributions to the equity test.



CDO Structure

- Coverage Tests (Continued)

- A CDO contains tests that seek to maintain the credit quality and diversification of the collateral portfolio, including the collateral quality tests and the concentration limitations.
- There are four collateral quality tests:
 - Diversity test: Governs the diversification of the portfolio by means of a numerical score that measures the obligor and industry diversification.
 - Rating factor test: Governs the credit quality of the portfolio via a numerical score which represents the weighted average rating of the portfolio.
 - Minimum weighted average spread: Maintains the average spread on the portfolio.
 - Maximum average life test: Typically limits the maturity profile of the collateral portfolio.
- Concentration limitations consist of four tests that attempt to set minimum and maximum concentration levels in the portfolio:
 - In collateral types;
 - Industries; and
 - Concentrations in single obligors.
- In order to purchase collateral as it actively manages the CDO portfolio, a collateral manager typically must ensure that each trade will maintain or improve the levels of any coverage tests, collateral quality tests, and concentration limitations that are failing.



The Collateral Manager's Role in a CDO

- A collateral manager is responsible for the performance of the collateral portfolio. He or she typically:
 - Selects the collateral portfolio;
 - Directs sales and purchases of collateral during the reinvestment period;
 - Oversees the work-out process for defaulted collateral; and
 - Monitors the collateral portfolio for compliance with the coverage, collateral quality, and other tests.
- The collateral manager's ability to generate high risk-adjusted returns through his or her research, market knowledge, and trading is a key determinant of the success of the CDO.
- CDO collateral managers come from a variety of asset management organizations that have expertise in managing the applicable asset class. This includes mutual fund companies, insurance companies, banks, private equity funds, and specialist asset management companies.



The Collateral Manager's Role in a CDO - Evaluating a CDO Collateral Manager

- There is no single formula to success for a CDO collateral manager, but the following criteria may be used to evaluate the strength of a collateral management franchise:
 - Reputation
 - Investment strategy
 - Investing expertise and work-out ability
 - CDO experience
 - Continuity of management team and bench strength
 - Financial strength of overall organization
 - Access to collateral
 - Alignment of interests / commitment of capital
 - Commitment to CDO market
 - Communication with investors



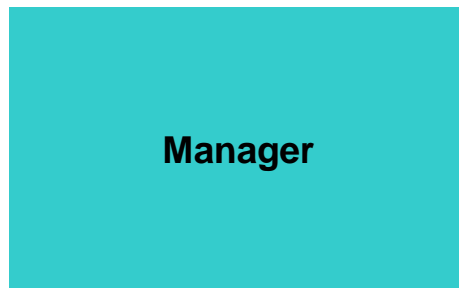
CDOs as Investment Vehicles

- Investment Decisions

- An asset class and asset manager decision are typically made before a CDO investment can be evaluated:



- Investor selects an asset class that he or she believes will provide good risk/return.



- Investor then decides whether to use an outside asset manager and, if so, which manager is likely to produce superior results given the market environment.



- After choosing an asset class and a manager, the investor typically has multiple ways to invest with that manager in the asset class.
- These choices are not mutually exclusive; many investors will choose a variety of investment vehicles over time.



CDOs as Investment Vehicles - Managed Investment Options

- The choice of investment vehicle will depend on a variety of factors. It is also important to take into consideration the leverage of CDO equity when comparing options.

Separate Account

- Investor can influence investment guidelines
- Usually liquid (varies with asset class)
- Typically requires a relatively large investment amount
- Generally less diversified than alternatives for a given investment amount
- Full upside/downside on asset performance

Pooled Fund (Mutual Fund)

- Typically fixed investment style (“one size fits all”)
- Usually liquid, if it is an open-end fund
- Small investment size possible
- Generally diversified
- Full upside/downside on asset performance

CDO Equity

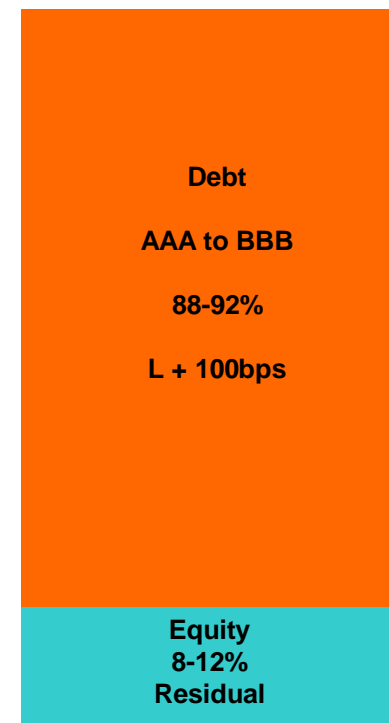
- Lead investor can influence investment guidelines and structure
- Usually illiquid
- Very small investment size possible
- Generally diversified
- Limited exposure to downside but leveraged; similar to call option



CDOs as Investment Vehicles - Risk Profile of CDO Equity

- CDO equity is a leveraged investment which must be taken into account when sizing an investment.
 - \$1 of equity may be “equivalent” to \$10 of a direct investment.
- It is similar to a call option in that, it has
 - Unlimited upside, and limited downside (relative to equivalent investment),
 - But can lose entire “premium,” which is the equity investment.
 - The Return on “premium” is volatile.
- Unique features of CDO equity include:
 - Usually current distribution of excess cash flow;
 - Typically no margin or mark-to-market features in the financing;
 - Long-dated leverage;
 - Non-recourse.

Asset Yield: L + 300 bps

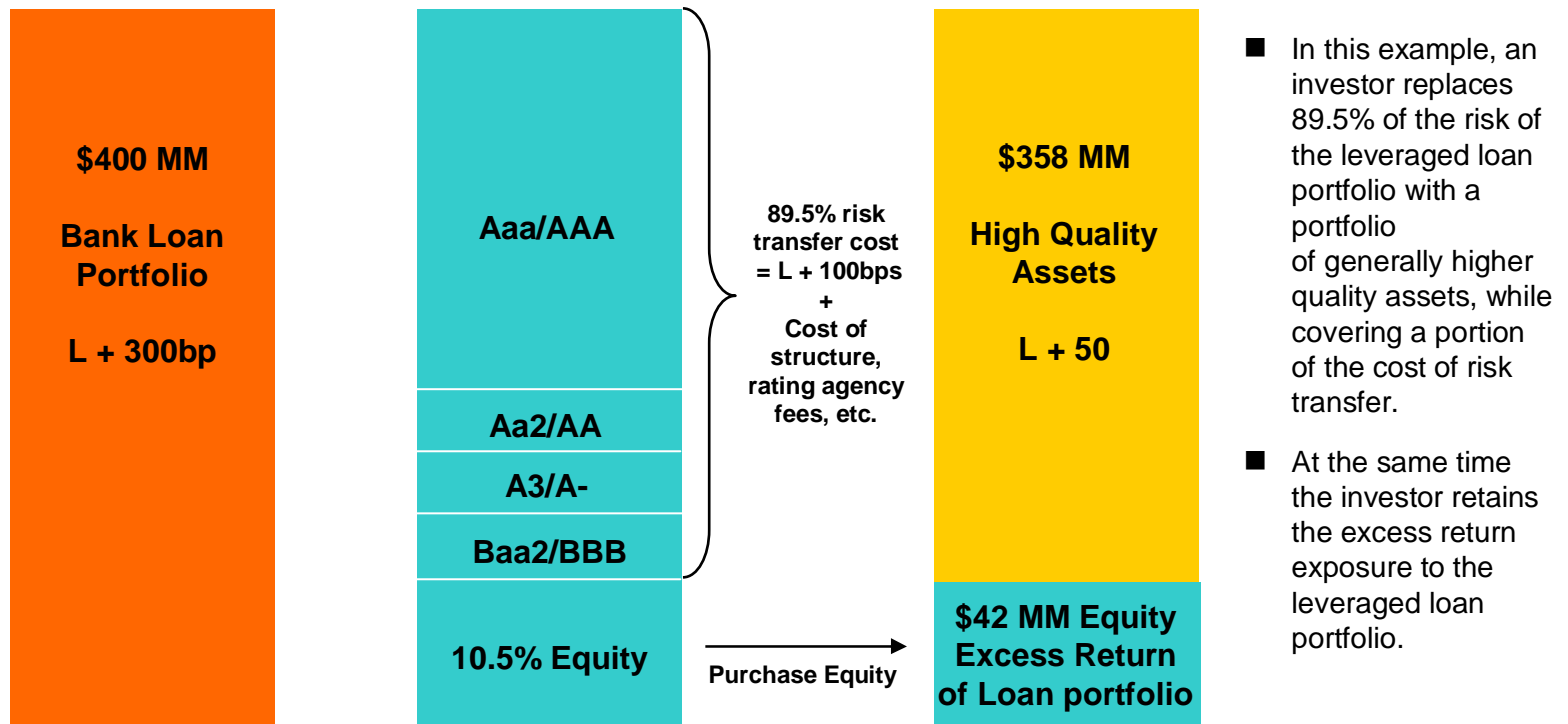




CDOs as Investment Vehicles

- Risk Profile With Replicating Portfolio

- One way to compare CDO equity with a direct investment is to create a “replicating portfolio.”



- In this example, an investor replaces 89.5% of the risk of the leveraged loan portfolio with a portfolio of generally higher quality assets, while covering a portion of the cost of risk transfer.
- At the same time the investor retains the excess return exposure to the leveraged loan portfolio.



Examples of Underlying Sectors

- Commercial real estate
 - Conduit, credit tenant leases, non-performing loans, franchise, commercial real estate repackagings
- Residential real estate
 - Prime, subprime, second lien, manufactured housing, agency
- Consumer ABS
 - Credit cards, autos, student loans
- Commercial ABS
 - Equipment leases, airplane leases, whole business securitizations, future flow transactions
- CDOs
 - Structured products, leveraged loans, high yield bonds, trust preferred, CDOs of CDOs
- Insured securities
- REIT debt
- Esoteric assets
 - Future flows, utility receivables, mutual fund fees, health care receivables



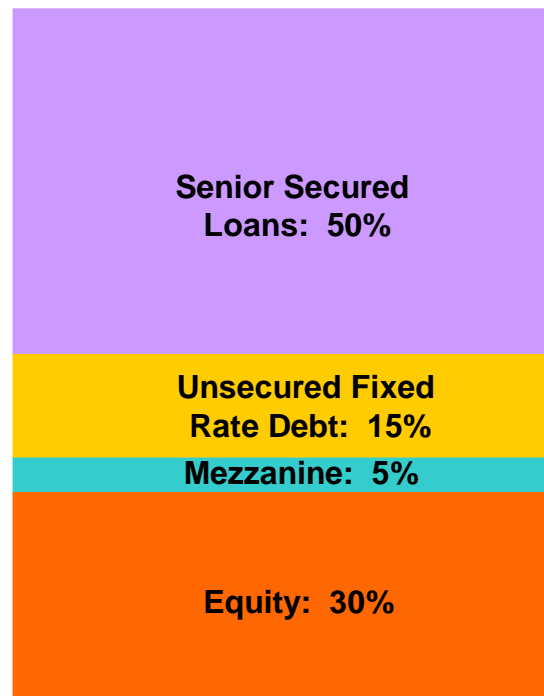
What Is a Collateralized Loan Obligation (CLO)?

- The collateral for a CLO consists primarily of leveraged loans.
 - Leveraged loans are generally syndicated bank loans made to borrowers with non-investment grade credit ratings.
 - The US leveraged loan market has typically high liquidity.
 - Default rates for leveraged loans have historically tracked significantly lower than default rates for high yield bonds.
 - Recovery rates for leveraged loans have historically tracked significantly higher than recovery rates for high yield bonds.
- Cash flow arbitrage CLO issuance topped \$16 billion in 2003.
- CLOs own an estimated 60% of the US dollar institutional leveraged loan market.



Bank Loan Collateral and the Bank Loan Market

- Below is a typical sub-investment grade corporate capital structure:





Leveraged vs. Structured Loans - Generalized Characteristics

	Leveraged Loans	Structured Products
Collateral Characteristics	<ul style="list-style-type: none"> ■ Sub-investment grade ratings ■ Well structured debt covenants ■ High historical recoveries upon default ■ Incremental yield vs. comparably rated corporates 	<ul style="list-style-type: none"> ■ Investment grade ratings ■ Collateralized securities ■ Minimal event risk ■ Incremental yield vs. comparably rated corporates
Approximate Asset Yield	<ul style="list-style-type: none"> ■ +275 – 300 	<ul style="list-style-type: none"> ■ +170 - 180 for triple-B rated portfolios ■ +75 - 80 for double-A rated portfolios
Approximate Cost of Debt	<ul style="list-style-type: none"> ■ +60 	<ul style="list-style-type: none"> ■ +60 for triple-B rated portfolios ■ +38 for double-A rated portfolio
Approximate Cost of Debt Including Up-front and Ongoing Expenses	<ul style="list-style-type: none"> ■ +100 	<ul style="list-style-type: none"> ■ +85 for triple-B rated portfolios ■ +50 for double-A rated portfolio
Approximate Equity Yield	<ul style="list-style-type: none"> ■ 14%-18% 	<ul style="list-style-type: none"> ■ 14%-18% for triple-B rated portfolios ■ 15%-20% for double-A rated portfolio



Comparison of Typical Investment Formats

	Cash CDO Equity	Synthetic CDO Equity	Hedge Fund	Mutual fund
Collateral Types	Leveraged loans, MBS, ABS	Investment grade and sub-investment grade corporate bonds	Corporate bonds, MBS, ABS	Corporate bonds, MBS, ABS
Degree of Possible Customization	High with respect to portfolio and structure	High, with respect to portfolio	Little	None
Use of Leverage	High	Highest	Significant, repo	None
Market-to-Market Sensitivity to Underlying Assets	Moderate	High	Highest	Unleveraged
Fees	Low	None	Highest, with significant incentive fee	Moderate
Term	6-10 years, longer legal final	5-7 years	Redeemable until 1- 6 months notice	Redeemable on short notice



IX. Constant Maturity Mortgage (CMM)



What Is CMM?

- The CMM index is the bond-equivalent yield on a new MBS TBA , which prices at par.
 - The most common market this is indexed against is the 30-year agency mortgage market.
 - The spot rates at any given date are typically priced as below:

Weighted Average
based on 30 days
from point of
calculation

TBA Coupon	Current Month Settle Price	Forward Month Settle Price	30-Day Forward Price	Delay Adjustment	Par Price	Monthly Yield	Bond Equivalent Yield (Semi-Annual)
4.5	94-06	93-26	94-03	94-125			
5.0	97-12	96-31+	97-087	97-19+	100	5.40%	5.461%
5.5	100-10+	99-296	100-073	100-19			
6.0	102-28+	102-17+	102-256	103-06+			

- Once spot rates exist, a forward curve can be constructed.
- This is an attempt to simplify the trading of mortgage price risk by transforming the most liquid portion of the mortgage market into a rate based market.
- Since the index is derived directly from the liquid MBS, its value is generally transparent to all players in the market.



CMM in the Market

- Spot rates are determined by always pricing a security at par, so prepayments are not taken into account.
- Hence, this yield is not subject to prepayment modeling risk.
- Swaps allow the bond market to be viewed in a pure rate sense; in a similar way, CMM allows this of the mortgage market.
 - CMM can be used to hedge for mortgage products that are sensitive to changes in mortgage rates.
- CMM products include:
 - Swaps: Pay / receive fixed and receive / pay CMM.
 - Swaptions: Option to enter into CMM swap, either pay or receive CMM verses fixed.
 - Caps / Floors: Cap or floor on CMM rate.
 - Basis Swaps: Pay / receive CMM versus receive / pay a LIBOR, CMS, or CMT rate.



CMM Summary

- Generally no convexity.
- Generally no prepayment sensitivity.
- Typically automatically rebalanced to maintain current coupon exposure.
- CMM forwards are derived from pass-thrus forwards, and therefore generally capture any financing advantages available.
- It is possible to trade forwards up to five years in the future.



Disclosures



Copyright 2004. The Goldman Sachs Group, Inc. All rights reserved.

This material was prepared by the Mortgage Strategies Group within the Fixed Income, Currency and Commodities Division and is not the product of Goldman Sachs Global Investment Research. It is not a research report and should not be construed as such.

The Goldman Sachs Group, Inc. is a full-service, integrated investment banking, investment management, and brokerage firm. We are a leading underwriter of securities and a leading participant in virtually all trading markets. We have investment banking and other business relationships with a substantial number of companies. Investors should assume that The Goldman Sachs Group, Inc. and/or its affiliates are conducting, seeking or will seek investment banking or other business from any company or companies that may be mentioned in this material and trade or will trade as principal in the securities of those companies. The professionals who prepared this material are paid in part based on the profitability of The Goldman Sachs Group, Inc., which includes earnings from the firm's trading, capital markets, investment banking and other business. They, along with other salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients that reflect opinions that are contrary to the opinions expressed herein, and our proprietary trading and investing businesses may make investment decisions that are inconsistent with the views expressed herein. In addition, the professionals who prepared this material may also produce material for, and from time to time, may advise, Goldman Sachs sales and trading desks.

This material should not be construed as an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. We are not soliciting any action based on this material. It is for the general information of clients of The Goldman Sachs Group, Inc. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Before acting on any advice or recommendation in this material, clients should consider whether it is suitable for their particular circumstances and, if necessary, seek professional advice. The price and value of the investments referred to in this material and the income from them may go down as well as up, and investors may realize losses on any investments. Past performance is not a guide to future performance. Future returns are not guaranteed, and a loss of original capital may occur. The Goldman Sachs Group, Inc. does not provide tax advice to its clients, and all investors are strongly advised to consult with their tax advisers regarding any potential investment. Certain transactions - including those involving futures, options, and other derivatives as well as non-investment-grade securities - give rise to substantial risk and are not suitable for all investors. The material is based on information that we consider reliable, but we do not represent that it is accurate, complete and/or up to date, and it should not be relied on as such. Opinions expressed are our current opinions as of the date appearing on this material only.



We and our affiliates, officers, directors, and employees, including persons involved in the preparation or issuance of this material, may from time to time have “long” or “short” positions in, act as principal in, and buy or sell the securities or derivatives (including options) thereof in, and act as market maker or specialist in, and serve as a director of, companies mentioned in this material. In addition, we may have served as manager or co-manager of a public offering of securities by any such company within the past three years.

This material is distributed in the United States by Goldman, Sachs & Co., in Hong Kong by Goldman Sachs (Asia) L.L.C., in Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch, in Japan by Goldman Sachs (Japan) Ltd., in Australia by Goldman Sachs Australia Pty Limited (ACN 092 589 770), and in Singapore by Goldman Sachs (Singapore) Pte. This material has been issued by The Goldman Sachs Group, Inc. and/or one of its affiliates and has been approved for the purposes of section 21 of the Financial Services and Markets Act 2000 by Goldman Sachs International, which is regulated by the Financial Services Authority, in connection with its distribution in the United Kingdom, and by Goldman, Sachs & Co. in connection with its distribution in Canada. We may, to the extent permitted under applicable law, have acted on or used this material prior to or immediately following its publication. Foreign-currency-denominated securities are subject to fluctuations in exchange rates that could have an adverse effect on the value or price of, or income derived from, the investment. In addition, investors in securities such as ADRs, the values of which are influenced by foreign currencies, effectively assume currency risk. In addition, options involve risk and are not suitable for all investors.

Further information on any of the securities mentioned in this material may be obtained on request, and for this purpose, persons in Italy should contact Goldman Sachs S.I.M. S.p.A. in Milan or its London branch office at 133 Fleet Street; persons in Hong Kong should contact Goldman Sachs (Asia) L.L.C. at 2 Queen's Road Central; and persons in Australia should contact Goldman Sachs Australia Pty Limited. This material is not for distribution in the United Kingdom to private customers, as that term is defined under the rules of The Securities and Futures Authority. A glossary of certain of the financial terms used in this material is also available on request. Unless governing law permits otherwise, you must contact a Goldman Sachs entity in your home jurisdiction if you want to use our services in effecting a transaction in the securities mentioned in this material.

Note: Options involve risk and are not suitable for all investors. Please ensure that you have read and understood the current options disclosure document before entering into any options transactions.