SECURITIES LITIGATION & CONSULTING GROUP

A CMO Primer:
The Law of Conservation of Structured Securities Risk

by
Craig McCann, Ph.D., CFA[1]

The collapse of Brookstreet Securities and the bailout of two Bear Stearns hedge funds on the brink of collapse have focused attention on collateralized mortgage obligations ("CMOs").[2] The collapse of the subprime lending market, lax loan underwriting standards and misleading credit ratings have combined to cause dramatic investor losses in 2007. These recent CMO losses closely parallel earlier CMO losses. In 1994, a significant increase in interest rates and misleading interest rate risk disclosure caused many bond mutual funds to fall in value far more than expected. These funds had invested heavily in CMOs, for which the funds' simplistic interest rate risk disclosure was misleading. Today's CMO losses resulted from the relatively recent introduction of CMOs with substantial credit risk and the inadequate or misleading way in which that credit risk was disclosed. This article provides a selective history and a brief description of CMOs in an effort to enable practitioners to evaluate the merits of a potential CMO case.

Introduction

Prior to the 1980s, homeowners applied to their local savings and loan, bank or mortgage company for a loan to purchase or refinance a home. The lending institution would assess the terms of the loan, the borrower's creditworthiness and the value of collateral. If the institution extended a loan, the homeowner would make monthly principal and interest payments through a "servicer" which could be a department of the lender or an independent company that specialized in bookkeeping for mortgages. If the

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 Dr. McCann can be reached at 703-246-9381 or craigmccann@slcg.com.
[2] "Brookstreet to Liquidate Positions After Margin Call From Fidelity Unit" *The Wall Street Journal*, June 22, 2007; "$3.2 Billion Move by Bear Stearns to Rescue Fund", *The New York Times*, June 23, 2007.

homeowner was late, the servicer would pester him and if the borrower ultimately defaulted the lender would foreclose.

There was accountability in this framework. If a borrower defaulted, the lending institution's shareholders suffered. Shareholders could hold bank managers and lending officers accountable for mismanagement and had good incentives to do so. As a result of so-called *innovations* in mortgage financing and securitization, accountability has been diffused and dramatically reduced. Potential liability for the sale of these products to investors has not lessened, however.

Agency Mortgage Pass-Through Securities

In the 1980s, Fannie Mae and Freddie Mac – private companies sponsored by the Federal government – bought qualified mortgage loans from lenders and used the mortgages as collateral to issue pro-rata interests in pools of mortgages. An investor in these newly issued "agency" mortgage pass-through securities or mortgage backed securities ("MBS") received a pro-rate share of the periodic interest and principal payments made by borrowers on an underlying pool of mortgages, after the payment of a servicing charge.

Agency pass-through securities made investing in mortgages much more attractive to investors by eliminating credit risk. Investors received timely interest and principal payments whether or not borrowers made their monthly payments in a timely fashion.[3] Agency pass-though securities thus *expanded* the available mortgage funding, *lowered* mortgage interest rates and *increased* home ownership.

Prepayment Risk

Despite being free of credit risk, agency pass-through securities had significant interest rate risk. Pass-through securities' interest risk is similar to the interest risk in

[3] Fannie Mae and Freddie Mac guaranteed timely payment of principal and interest on their pass-through securities. Ginnie Mae – a Federal government agency – guarantees timely principal and interest payments on privately issued pass-through securities backed by FHA and VA loans.

ordinary bonds but is amplified by borrowers' ability to prepay their mortgages.[4] On average, mortgages are paid off well before their stated maturity. For example, 30-year mortgages are paid off on average after only 16 or 18 years at typical prepayment rates.

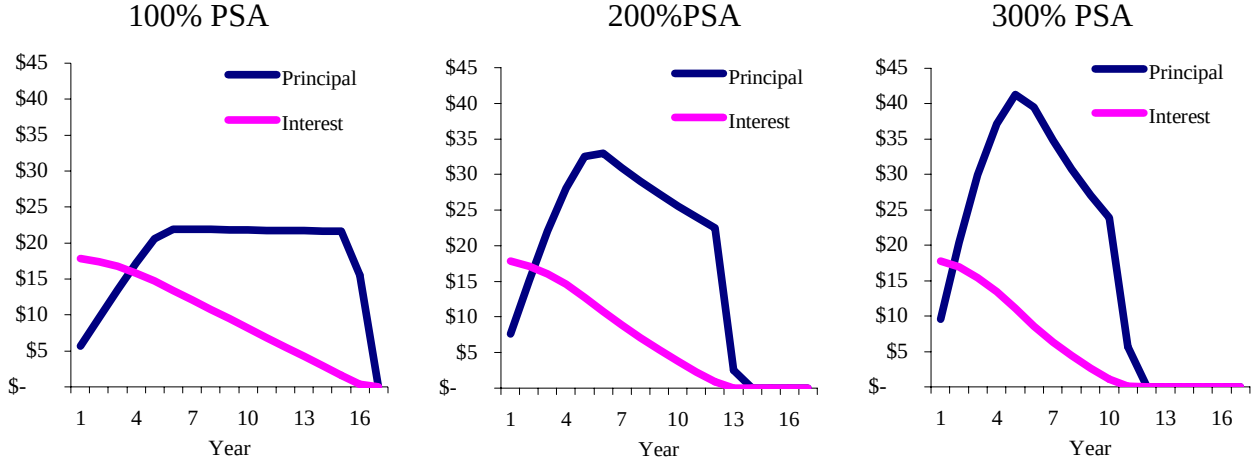
When interest rates fall, homeowners refinance, paying off their mortgages either: (a) to take advantage of the lower interest rates available compared to when the mortgages were first taken out or (b) to move up since monthly payments on the next size/quality home up is now more affordable. These accelerated prepayments harm investors because the investor must reinvest principal, received earlier than expected, at lower currently available re-investment rates. On the other hand, when interest rates rise, mortgage prepayments come in slower than initially expected. These reduced prepayments harm investors because the investor is not able to reinvest as much principal at the new, higher, current interest rates as had been anticipated before interest rates rose.

The fraction of a pool of mortgages which will prepay in any period – known as *the prepayment speed* – can be estimated as a function of characteristics of the mortgages in the pool such as the average age and average coupon rate of the mortgages. Prepayment speeds are usually quoted as a percent of the Public Securities Association ("PSA") standard assumptions. Changes in interest rates are the primary determinants of changes in prepayment speeds.

Figure 1 illustrates the impact of prepayment speeds equal to 100%, 200% and 300% of PSA on the annual payments of principal and interest from a $300 million pool of 30-year mortgages.[5]

[4] The price of a fixed coupon bond increases when interest rates fall because bondholders continue to receive the fixed coupon rate which is now above market. Unless the bond is callable, a corporate issuer would have to pay investors more than par to redeem bonds and stop paying the above market coupon rate.
[5] Prepayment speeds are quoted as a percent of the Public Securities Association ("PSA") base assumption. The PSA base assumes that monthly prepayments increase linearly from 0% to 6% over the first 60 months and then remains at 6% per month until the mortgages are assumed to be paid off.

Figure 1
Annual Principal and Interest Payments by Prepayment Speed



The impact of changes in interest rates and resulting changes in prepayment speeds on the value of a mortgage pass-through security can be readily estimated. The cash flows from a pool of mortgages can be forecasted for a given prepayment speed assumption and then discounted at a credit spread above the Treasury yield curve that equates the present value of the cash flows to the market price of the security. Changes in prepayment speed and yield curve assumptions generate alternative discounted cash flow values, allowing the analyst to evaluate the sensitivity of the mortgage pass-through security to interest rates and prepayment speeds.

Collateralized Mortgage Obligations Circa 1994

Pass-through securities were not attractive to some investors because they had more risk – especially prepayment risk - than non-callable coupon bonds. Financial engineers knew that the cash flows coming out of a pool of mortgages didn't have to be paid out in the strictly pro rata fashion of pass-through securities. As long as every dollar of principal and interest paid on the mortgages after servicing costs – but not a dollar

more – was allocated to a security holder, each pool of mortgages, however homogenous, could support a wide variety of complex structured securities.[6]

The customized classes of CMOs have been referred to as *tranches* after the French word for "slice". Tranches in early CMO deals were typically sequential-pay securities. That is, principal payments would be applied to tranches sequentially with lower priority tranches to receive principal payments only after higher priority tranches' principal balances are paid off.

Redistributing Risk

Planned amortization classes ("PACs") were designed to have stable maturities and cash flows over a broad range of prepayment speeds. Principal and interest payments on the underlying mortgages were allocated to meeting the principal amortization schedules and interest obligations of the PACs. Any principal payments in excess of what was required for the PACs would be allocated to the "support" tranches. PACs could therefore be designed to look exactly like a Treasury security with fixed cash flows and no credit risk.

Since all classes in a deal collectively had the prepayment risk of the underlying pool of mortgages and the PACs had little or no prepayment risk, the remaining securities bore a concentrated amount of prepayment risk. The more protected the PACs in a CMO deal were from prepayment risk and the bigger these PAC classes were, the more concentrated the prepayment risk borne by the support classes.

CMO classes were also created to redistribute interest rate risk. Floating rate CMOs ("floaters") are CMOs whose coupon rates fluctuate up and down with a specific indicative interest rate – typically LIBOR. Floating rate notes were attractive to buyers because they had virtually no interest rate risk. The coupon rates paid on the underlying mortgages were almost always fixed, so if there was a floating rate class, there invariably

[6] Financial marketers knew that if they could structure securities so that unsophisticated investors would buy the securities with high concentrations of interest rate and prepayment risk, the low risk securities would sell themselves.

had to be a roughly equivalent size class whose coupon rates moved up and down in the opposite direction as interest rates. Since floating rate bonds have no interest rate risk, the offsetting "inverse floaters" had roughly twice the risk of a fixed rate bond.

Issuers could issue much larger floating rate classes if they added leverage to the inverse floaters, making their coupons change by a multiple as high as six or eight times the change in the reference interest rate. For example, $20 million in inverse floating notes could offset $100 million in floating rate notes if the inverse floater had a coupon that adjusted five times the change in the reference interest rate. These leveraged inverse floaters had as much as ten times the interest rate risk as an ordinary bond with the same stated maturity and duration[7] and were the source of much of the CMO losses in 1994.

Issuers also created classes of securities that only received payments of interest ("IO strips") or received only payments of principal ("PO strips") on the underlying mortgages. These IO and PO strips had highly unstable market values and were therefore extremely risky. If interest rates fell after an investor purchased an IO strip, the underlying mortgage loans would pay off more rapidly than expected and the IO strip would stop making payments earlier than had been anticipated. While IO investors lost when interest rates fell, PO investors gained since they would receive their cash flows from principal payments earlier than expected. If interest rates increased, IO investors gained and PO investors lost as the mortgages returned principal to PO investors more slowly and continued to make interest payments longer than expected.

The Law of Conservation of Mass Applies to Structured Securities

Mortgages have interest rate risk, prepayment risk and credit risk because of the behavior of borrowers and the features of the mortgages. A pool of mortgages has the average interest rate risk, prepayment risk and credit risk of the individual mortgages in the pool just as surely as it has their average coupon rate and average maturity. If

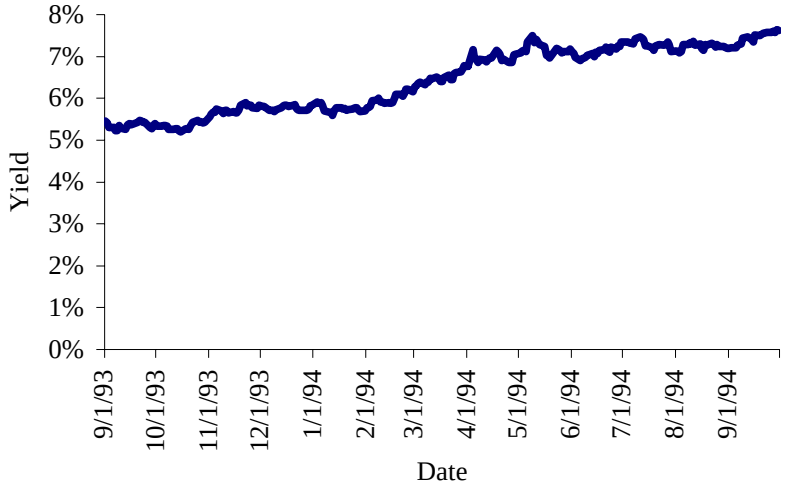
[7] Duration is a measure of interest rate risk. Roughly speaking a bond's price will move in the opposite direction as changes in interest rates in proportion to the bond's duration. For example, if the yield on a bond with a duration of 6 increases 0.5%, say from 6.0% to 6.5%, the bond's price will fall 3% (i.e. 6 * 0.5% = 3%). Duration and related concepts are explained in the Appendix.

investors purchase 1/100th interests in a pool of mortgages, the owner of each interest bears the same interest rate risk, prepayment risk and credit risk as the owners of the other interests and collectively they own all the risks of the entire portfolio. This principle is so fundamental to understanding mortgage-backed securities that I think it warrants being called *The Law of Conservation of Structured Securities Risk*. When issuers created CMO classes that had less than a pro rata amount of interest rate or prepayment risk, they had to include in the same deals classes with more interest rate risk or prepayment risk than average in the underlying mortgages.

The Reckoning

Interest rates rose repeatedly in late 1993 and early 1994. The average yield on ten year Treasury securities increased almost 1.5% from 5.62% during the fourth quarter of 1993 to 6.08% during the first quarter of 1994 and to 7.08% during the second quarter of 1994. *See* Figure 2.

Figure 2
Yields on 10-Year Constant Maturity Treasuries
September 1, 1993 – September 30, 1994



Piper Jaffray's Institutional Government Income Fund ("PJIGX") and Fundamental Portfolio Advisors' ("FPA") Fundamental U.S. Government Strategic Income Fund are two prominent examples of bond mutual funds whose net asset values

dropped significantly more in response to increases in interest rates than they should have given the funds' risk disclosures. This roughly 150 basis point[8] increase in interest rates in 1994 could be expected to cause bonds and bond mutual funds to drop in value with longer maturity bonds falling more than shorter maturity bonds. Intermediate term bond funds like the Piper Jaffray and FPA funds should have lost about 5% of their value as a result of the increase in interest rates illustrated in Figure 2.

Piper Jaffray marketed its Institutional Government Income Fund ("PJIGX") to investors who wanted to invest in short and intermediate term fixed-income securities issued by the U.S. government and government agencies.[9] Over time, Piper Jaffray significantly deviated from its stated investment policy, investing substantially all its portfolio in CMOs by 1993 and leveraging up this portfolio with repurchase agreements.[10] The securities PJIGX loaded up on were extraordinarily risky leveraged inverse floaters. These inverse floaters were especially poorly described by the fund characteristics Piper Jaffray reported to investors. As interest rates rose in 1994, PJIGX's net asset value plummeted well beyond what a true portfolio of short and intermediate term government bonds would have declined.[11]

FPA sold its Fundamental U.S. Government Strategic Income Fund as a safe investment for conservative investors wishing to invest in high quality, short and intermediate term government securities.[12] FPA claimed to limit the volatility of the

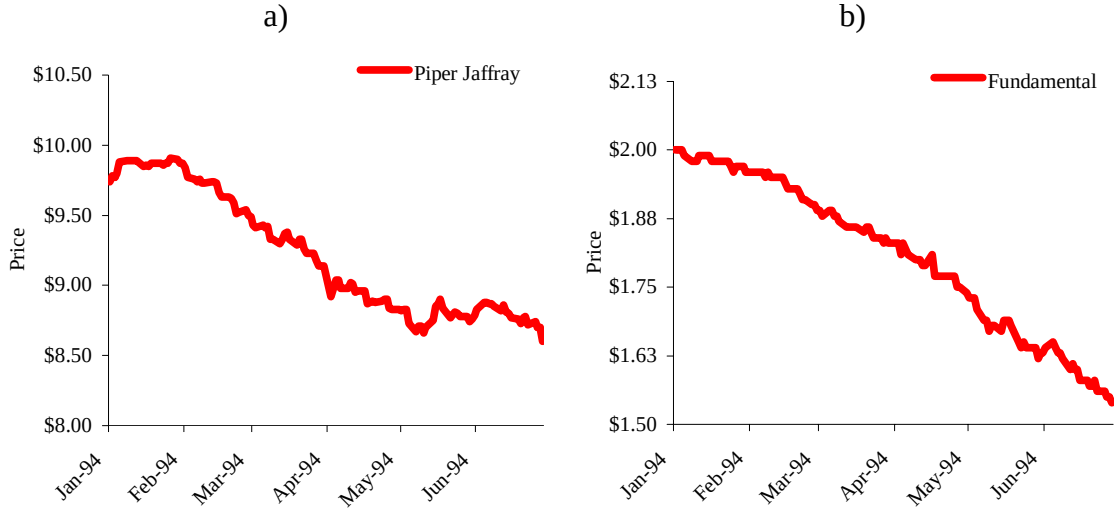
[8] 100 basis points = 1%.
[9] In the Matter of Piper Capital Management, Inc., Marijo A. Goldstein, Robert H. Nelson, Amy K. Johnson, and Molly Destro, Securities Act of 1933 Release No. 8276, August 26, 2003 available at http://www.sec.gov/litigation/opinions/33-8276.htm.

[10] Hedge fund Askin Capital Management imploded in 1994 because it made a leveraged bet on these highly interest-rate sensitive mortgage-backed securities. See "Investment Funds Are Liquidated", *The New York Times*, April 1, 1994.
[11] PJIGX's NAV fell in part because of the undisclosed interest rate risk in its portfolio and in part because of undisclosed liquidity risk. CMOs are not thickly traded and prices are approximations at best of what could be realized. Some of the prices Piper used to report its NAV had become stale in March 1993. The crisis at PJIGX became apparent with the coincidental failure of Askin Capital management when fresh prices turned out to be much lower than Piper had been reporting.
[12] In the Matter of Fundamental Portfolio Advisors, Inc., Lance M. Brofman, and Fundamental Service Corporation, Securities Act of 1933 Release No. 8251, July 15, 2003 available at www.sec.gov/litigation/opinions/33-8251.htm.

fund's NAV due to interest rate fluctuations by maintaining a duration of three years. This is roughly the interest rate risk of a portfolio of five year Treasury securities. The fund languished in the bottom half of its Lipper and Morningstar peer groups during its first year in existence, so its assets under management grew slowly.

Knowing the only way to attract significant investor cash was to vault into the top tier of its peer group, FPA copied Piper Jaffray's strategy and started buying significant amounts of inverse floaters in May 1993. Despite the significant increase in interest rate risk that the inverse floaters brought with them, the fund falsely continued to tout its low-risk investment strategy. By year end 1993, the fund was outperforming its peer group and attracting a significant number of new investors. When interest rates rose in late 1993 and early 1994, the fund's undisclosed risks resulted in dramatically lower NAVs than should have occurred given its claimed sensitivity to interest rates. *See* Figure 3.

Figure 3
CMO-heavy Funds
January 1, 1994 – June 30, 1994



Private Label CMOs

The CMOs featured in this brief history so far were all agency CMOs. That is, they had interest rate and prepayment rate risk from the underlying pool of mortgages but no credit risk. *Recent CMO losses have occurred because of the development of "private*

label" CMOs which have significant credit risk. Pass-through securities have many of the same features as agency securities but don't benefit from the agency securities' expressed or implied US Treasury guarantees. This credit risk, like the interest rate and prepayment risk in the 1994 CMOs, has not been adequately disclosed by the metrics used in CMO prospectuses.

CMOs are in the news today largely because of the spectacular failure of the subprime lending industry. Underwriters such as CSFB and subprime lenders such as Oakwood Mortgage Investors significantly expanded the borrowing of poor credit quality borrowers by bundling subprime mortgages into pools, carving the pools up into many smaller securities, obtaining investment grade ratings from Moody's and S&P, and then selling the securities as low risk. This was followed by a fall in housing prices and mortgage defaults.

OMI Trust 2001-E B-1

The $171,660,148 OMI Trust 2001-E 13 deal sold by Oakwood Mortgage Investors in November 2001 is a great illustration of the complex structure and targeted abuse in the private label CMO market. These securities were not worth $172 million when issued and the losses suffered by the lowest priority tranches were completely predictable. Figure 4 lists the securities offered to the public in the deal.

Figure 4
OMI 2001-E
Senior/Subordinated Pass-Through Certificates
Oakwood Mortgage Investors, Inc.

Class	Principal Amount	Offering Market Value	Coupon	Original WAL	Moody's	S&P
A-1	$39,400,000	$39,380,064	LIBOR + 0.30%	1.02	Aaa	AAA
A-2	$34,300,000	$34,291,932	5.05%	3.01	Aaa	AAA
A-3	$10,500,000	$10,498,668	5.69%	4.60	Aaa	AAA
A-4	$36,287,000	$36,274,186	6.81%	10.49	Aaa	AAA

[13] http://www.sec.gov/Archives/edgar/data/929541/000095010901505486/d424b5.htm

A-IO	$57,400,000[14]	$16,346,348	6.00%	5.08	Aaa	AAA
M-1	$16,352,000	$12,905,547	7.56%	9.81	Aa3	AA
M-2	$12,909,000	$13,881,426	8.76%	9.81	A3	A
B-1	$9,467,000	$8,081,978	7.50%	9.74	Baa3	BBB
Total	$159,215,000	$171,660,148				

The B-1 tranche in this deal and other similar lowly ranked tranches from other deals were sold to elderly investors in southern California as safe substitutes for bank CDs. These investors were falsely told that the CMOs would provide high yields and that their principal was safe.[15]

The assets in the OMI 2001-E Trust were predominantly subprime mortgages on manufactured homes. Many of the mortgages were on homes that had been previously repossessed; most were on the homes, but not on the land beneath them. Many of the loans were already delinquent or likely to become delinquent. They had an average remaining stated maturity of 26 or 27 years and carried an average mortgage interest rate around 10.5%. The home borrowers whose mortgage notes backed these CMOs were among the worst credit risks in the market place.

The prospectus describes the collateral as:

- manufactured housing installment sales contracts secured by interests in manufactured homes and, in some cases, by liens on the real estate on which the manufactured homes are located,
- mortgage loans secured by first liens on the real estate on which manufactured homes are permanently affixed, and
- cash in the pre-funding account.[16]

And among the risk factors listed in the prospectus were:

- **You May Experience A Loss On Your Investment If Losses And Delinquencies On Assets In The Trust Are High**

[14] The A-IO strip had a $57.4 million notional principal amount which is not included in the total at the bottom of the column. The notional principal is the amount against which the inerest rate is applied to yield the interest payment due on the IO strip.
[15] ; "Mortgage Bets Trip Up Main Street Investors – And a Group of Nuns" *The Wall Street Journal*, July 14, 2007.
[16] Page S-2.

> Manufactured housing usually depreciates in value. Over time, the market values of the manufactured homes could be less than the amount of the loans they secure. This may cause delinquencies and may increase the amount of loss following default. In this event, your trust may not be able to recover the full amount owed, which may result in a loss on your certificates. ...
>
> - **Losses Will Affect Subordinated Certificates Before Affecting More Senior Certificates**
>
> The class M-1, M-2 and class B-1 certificates are subordinated to the class A certificates. Losses in excess of the credit support provided by the class B-2, class X, and class R certificates will be experienced first by the class B-1 certificates, second by the class M-2 certificates, and next by the class M-1 certificates. ...[17]

As discussed above, the average credit quality of the securities backed by a pool of mortgages will have the same or lower than the average credit quality of the underlying mortgages unless the issuer has purchased meaningful credit insurance or has over-collateralized the securities. There was no credit insurance or over-collateralization in OMI 2001-E, despite the prospectus's claimed over-collateralization. The trust's assets totaled $172,159,171 or about 8% more than the eight securities' $159,215,000 principal listed in Figure 4. These eight securities were sold to the public at or shortly after the offering for $171,660,148. In addition to these eight securities, the collateral supported payments to the B-2, R and X classes not offered to the public and the servicer, Oakwood Acceptance, expected to take approximately 5% of the present value of any cash flows as a result of its 1% annual servicing charge. Thus there was no over-collateralization in this deal.

Without credit insurance or over-collateralization, the average credit quality of the tranches had to equal the subprime borrowers' credit quality. Yet, 76% of the tranches by market value were rated Aaa/AAA, 10% were rated Aa3/AA, 8% A3/A and the remaining 6% were rated Baa3/BBB by Moody's and S&P. Thus, Oakwood took $172 million worth of subprime paper backed by installment sales contracts on mobile homes, subtracted value and sold $172 million of "investment grade" securities.

[17] Page S-5.

The B-1 tranche was the riskiest of the securities offered to the public in this deal. The classes received principal sequentially with each class receiving principal payments only after all the higher ranked classes were paid off. The B-1 class would therefore not receive any principal payments until A-1, A-2, A-3, A-4, M-1, and M-2 were completely paid off. In addition to concentrating the interest rate risk on the B-1 class, this sequencing meant that B-1 provided credit support for all the higher ranked classes. Thus, the B-1 securities had much more credit risk than the subprime mortgages, which already had a high probability of default.

Not All Investors Are Equal

Not all investors who are sold CMO tranches – even in a deal like OMI 2001-E – are being taken advantage of. In fact, these deals were structured so that sophisticated investors received significantly higher risk-adjusted expected returns than they could find elsewhere. Unfortunately, these higher risk-adjusted returns to sophisticated investors were a wealth transfer from unsophisticated investors who bought the lower tranches like the B-1 tranche in our example.

Figure 5 lists the average yields to maturity on corporate bonds of different credit qualities and maturities when OMI 2001-E was issued on November 30, 2001. At 100% MHP[18], investors who bought the A-2 tranche would have their principal substantially paid off after four or five years. They received a 5.05% coupon, roughly 50 basis points more than they would have received on a four year or five year AAA corporate bond. Investors who bought the A-3 tranche likewise got approximately 50 basis points more than a AAA corporate bond with comparable cash flow timing.

[18] MHP is the base prepayment speed assumption for manufactured housing. It equals 3.7% per annum of the outstanding principal in the first month, increasing 0.1% per month for 24 months and then constant at 6.0% per annum until the mortgages are paid off. Base MHP therefore assumes more rapid pay down of principal than base PSA.

Figure 5
Corporate Bond Yields
November 30, 2001

	1 Year	3 Year	5 Year	10 Year	20 Year	30 Year
AAA	2.54%	3.92%	4.78%	5.66%	6.26%	6.20%
AA	2.88%	4.50%	5.27%	6.14%	6.76%	6.69%
A	3.14%	4.83%	5.57%	6.46%	7.07%	7.01%
BBB	3.79%	5.40%	6.11%	7.06%	7.89%	7.77%
BB	6.24%	7.58%	8.20%	8.92%	9.66%	9.59%
B	7.83%	9.33%	10.11%	11.00%	11.64%	11.67%

Investors who bought the top-tier tranches received higher returns than they could earn on AAA corporate bonds and were shielded from the interest rate risk, prepayment risk and credit risk by investors who bought the B-1 tranches. The B-1 tranche was not expected to be substantially paid off until after about ten years. B-rated, ten-year corporate bonds were paying 11% on November 30, 2001. B-1 tranche investors on the other hand were exposed to far greater risks than investors in B-rated corporate bonds and were given a coupon of 7.5%. OMI 2001-E and many other CMO deals transferred wealth from unsophisticated investors to investment banks, mortgage lenders, ratings agencies and sophisticated investors.

Conclusion

Current CMO losses have been attributed almost exclusively to the credit losses in subprime mortgages as a result of the simultaneous increase in interest rates and slowing of home price appreciation. This attribution is too superficial and too convenient.

The 1994 CMO losses illustrated how CMOs with substantial interest rate risk can be misrepresented to have little interest rate risk and sold to unsophisticated investors. The ability of investment banks and mortgage lenders with the help of ratings agencies to sell high risk securities to unsophisticated investors allowed them to put together deals that were attractive to sophisticated investors.[19] OMI 2001-E and many other CMO deals

[19] 44% of Moody's 2006 revenues came from providing credit ratings to CMOs and CDOs – significantly more revenue than it received from rating the credit of companies. "The Ratings Charade" *Bloomberg*

transferred wealth from unsophisticated investors to sophisticated investors, investment banks, mortgage lenders and ratings agencies.

Appendix

Duration

Piper Jaffray and FPA got into trouble in part because they misled investors about the interest rate risk in their CMO-laden portfolios. These advisors reported a measure of interest rate risk – duration – which is adequate for simple coupon bonds but which was wholly inadequate for CMOs. Of course, the funds' intentional understatement of risk made their returns in the early 1990s look extraordinary on a risk adjusted basis and caused investors to pour hundreds of millions of dollar into these hot funds.

Duration is equal to the weighted average time until the bondholder receives the remaining coupon interest and principal payments. Duration is measured in years like maturity but is less than maturity unless the bond is a zero coupon bond in which case the duration is equal to the maturity.

$$Duration = \sum_{i=0}^{T} w_i \times i = \sum_{i=0}^{T} \left(\frac{\frac{CF_i}{(1+ytm)^i}}{P_t} \right) \times i = \sum_{i=0}^{T} \left(\frac{\frac{CF_i}{(1+ytm)^i}}{\sum_{i=0}^{T} \frac{CF_i}{(1+ytm)^i}} \right) \times i$$

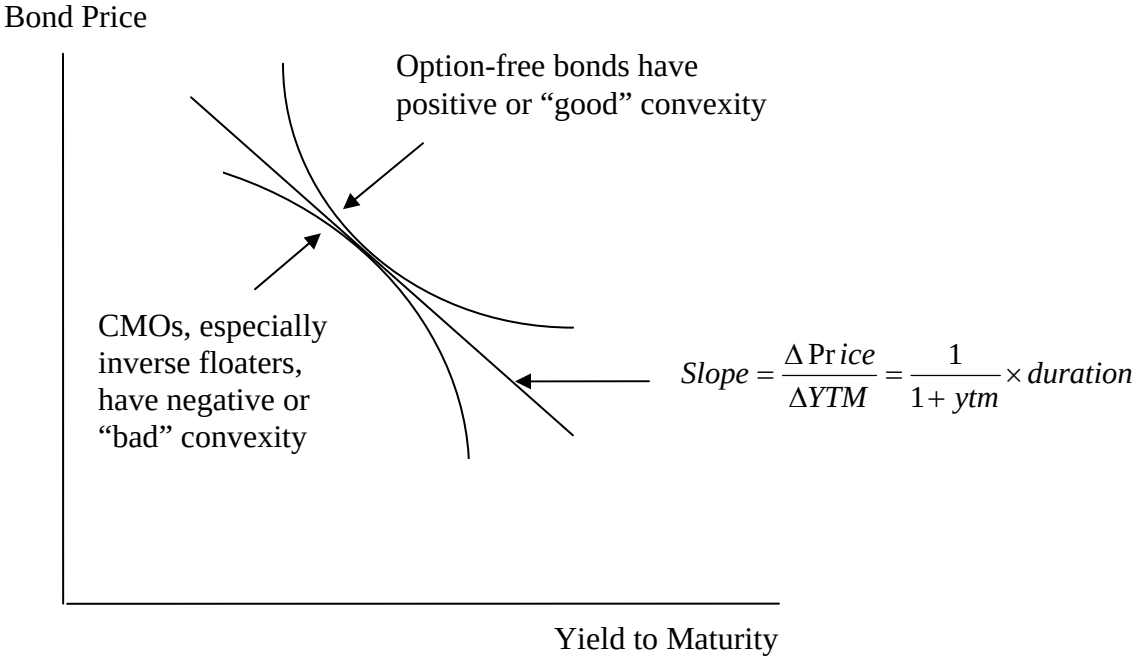
For small changes in yields:

$$\frac{\Delta \text{Price}_t}{\text{Price}_t} = -\Delta Yield_t \times \left(\frac{1}{1+ytm}\right) \times Duration_t$$

Duration is useful because the percentage change in a simple bond or bond fund's price is equal to the change in the bond's yield multiplied by the bond or bond fund's *modified* duration. Modified duration is equal to duration divided by one plus the yield to maturity and is equal to the slope of a line tangent to the bond price – yield relationship in Figure 6.

Markets July 2007. Ratings agencies, Moody's in particular, may yet be the big loser in the current CMO crisis. "Moody's Faces the Storm" *The Wall Street Journal,* July 10, 2007.

Figure 6
Duration Doesn't Capture Interest Rate Risk in CMOs



Convexity

Duration or modified duration only works for predicting bond price changes for small changes in yields to maturity. This is because the change in a bond's price for each basis point change in yield to maturity is not constant. Bond prices drop by smaller increments for successive increases in yields to maturity and increase by greater increments for successive decreases in yields to maturity. For example, an increase in the yield to maturity from 8% to 8.5% on an 8% 10-year coupon bond causes the bond's price to drop $53.98 but the same 0.5% increase from 9% to 9.5% causes the bond price to drop only $44.95. This feature is called convexity and is highly valued by investors since the greater a bond's convexity the more it's price will increase for any given decrease in interest rates and the less it will fall for any given increase in interest rates.

While option-free bonds have positive or "good" convexity, some CMOs – especially inverse floaters - have negative convexity. That is, their values drop more

rapidly, not less rapidly with successive increases in interest rates and increase more slowly, not more rapidly with decreases in interest rates.

Effective Duration

Effective duration incorporates the convexity of a CMO resulting from changes in prepayment speeds into the risk measure by simulating the value of a bond at higher and at lower assumed yields to maturity and consequently changing prepayment speeds. The difference in bond prices resulting from analyzing both changes in interest rates and prepayment speeds is a more accurate measure of risk for CMOs than simple duration.