



BANK FOR INTERNATIONAL SETTLEMENTS

Managing a MBS Portfolio

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2 September 2003



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Outline:

- Aggregating the risks in an MBS Portfolio
- Index Replication
- Relative Value Analysis

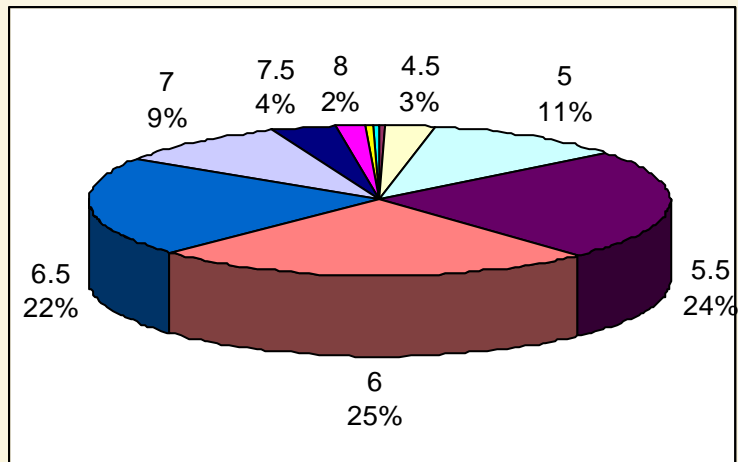


1. Basic risk categories

- Coupon
- Issuing agency
- Maturity/program
- Issue year

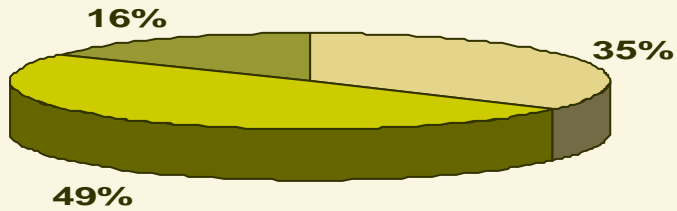
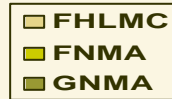


1. Coupon distribution

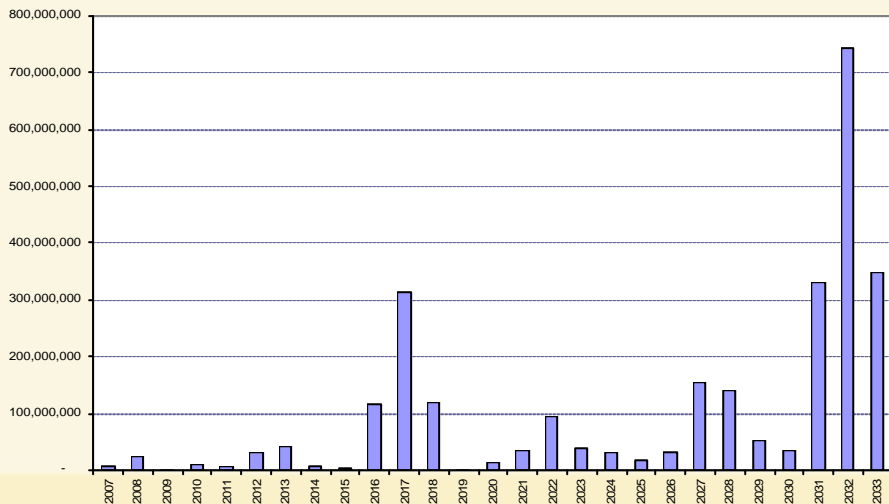




1. The Lehman MBS Index - \$2.8 trln



1. The Lehman MBS Index - Maturity





1. Factors impacting price changes

- Duration
- Yield curve re-shaping
- Current-coupon spread
- Volatility
- MBS-Treasury spread
- Convexity
- OAS

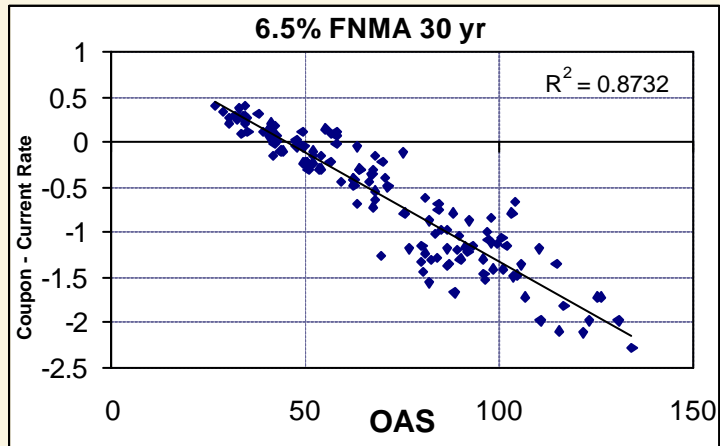


1. Further difficulties: effective vs empirical durations

- Effective duration assumes all risk factors remain constant
- Empirical duration assumes correlation of all risk factors with interest rates remains constant
- Differ most when OAS has significant negative correlation with interest rates



1. OAS and interest rates



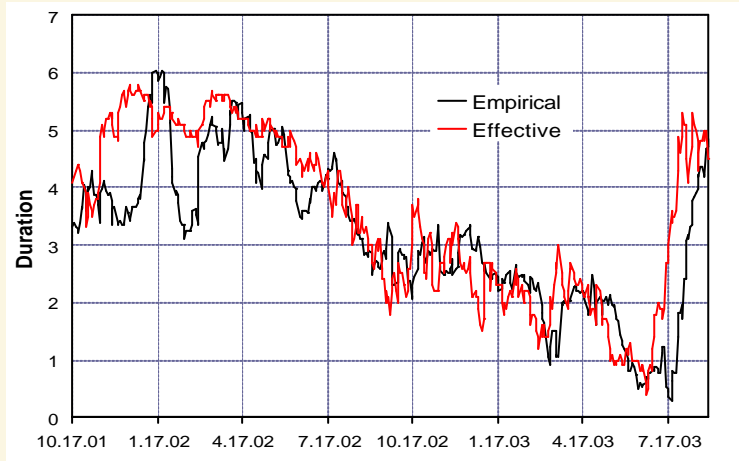
1. Calculating empirical duration:

$$\frac{\Delta P_t}{P_t} = a + b \Delta y_t (+p \Delta y_t^2)$$

where $-b$ = empirical duration
and p = empirical convexity
and t ranges from 20 - 40 days



1. Empirical and effective duration for FNMA 6%



2. Index Replication

- TBAs - Buy TBAs (Forward delivery) for a representative sample of coupons, issuer and program
- Actual pools – But a sample of MBS by coupon, issuer, program and issue year taking delivery.



2. Index replication – Available indexes

- Lehman MBS Index – 523 issues, 2.8 trln
- Salomon – 1.9 trln (30 yr)
- Merrill Lynch – 423 issues, \$2.55 trln

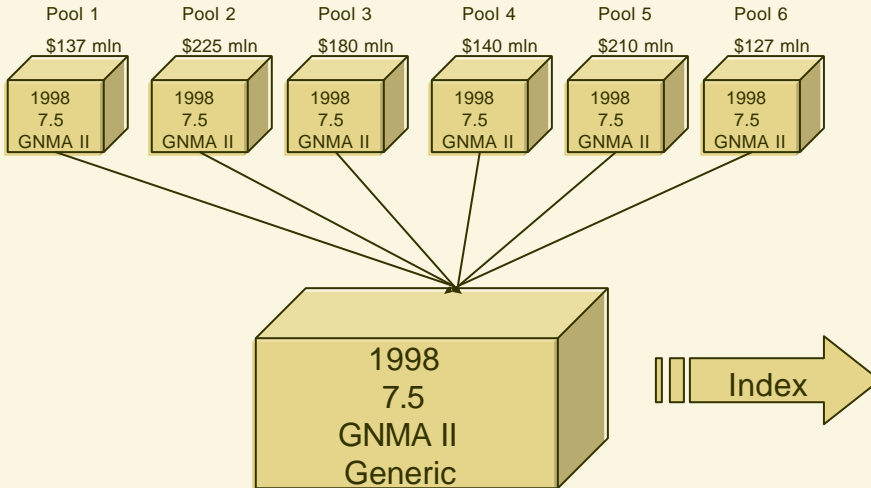


2. Index Replication – About the Lehman Index

- Each bond in the index is a generic – i.e. not tradable
- 526 bonds in the index
- 15 different programs / maturities
- Only 6 programs have 3% or more weighting



2. Benchmark Prices – How Generics are Created



2. Stratified sampling

- Take a sample that represents the index
- Break index down into risk categories (i.e. coupon, agency and program/maturity)
- Select bonds from each category in proportion to that category's representation in the total index

	5	6	7	8
FNMA				
GNMA				
FHLMC				



2. An example portfolio – Generic pools

	Coupon	Weight
GNMA I Single Family 'Midget' - 15 years	4.5	0.3%
	5	1.3%
	5.5	0.9%
	6	1.1%
	6.5	0.7%
GNMA I Single Family Pool - 30 years	7	0.4%
	5	1.7%
	5.5	12.0%
	6	14.4%
	6.5	17.7%
	7	12.4%
	7.5	5.3%
	8	3.6%
	8.5	1.0%
	9	1.0%
9.5	0.5%	
10	0.2%	

	Coupon	Weight
GNMA II Single Family 'Midget' - 15 years	5	0.0%
	5.5	0.1%
GNMA II Single Family Pool - 30 years	5	1.4%
	5.5	4.2%
	6	6.8%
	6.5	7.2%
	7	3.6%
	7.5	1.5%
	8	0.6%
	8.5	0.1%

27 Total
 22 Available as TBA
 Missing amount: 2.8%
 Not available as TBA

	Effective Duration	Yield
Lehman GNMA MBS Index	2.06	5.17
Generic portfolio	2.01	5.16



An Example Portfolio – TBAs

Program	Coupon	Nominal Amount	Weight
GNMA I Single Family 'Midget' - 15 years	4.5	660,419	0.3%
	5	2,621,468	1.3%
	5.5	1,777,402	0.9%
	6	2,310,187	1.2%
	6.5	1,376,146	0.7%
GNMA I Single Family Pool - 30 years	7	887,138	0.4%
	5	3,579,151	1.8%
	5.5	24,626,704	12.3%
	6	29,633,028	14.8%
	6.5	36,427,822	18.2%
GNMA II Single Family 'Midget' - 15 years	7	25,605,481	12.8%
	7.5	10,998,343	5.5%
	8	7,384,985	3.7%
	5	81,895	0.0%
GNMA II Single Family Pool - 30 years	5.5	110,025	0.1%
	5	2,935,802	1.5%
	5.5	8,609,112	4.3%
	6	14,046,347	7.0%
	6.5	14,729,808	7.4%
	7	7,356,561	3.7%
	7.5	3,048,676	1.5%
	8	1,193,498	0.6%
		200,000,000	100%



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A TBA Trade GNMA II 6%

GRAB Mtge **PTT**
 ENTER 1 <GO> TO UPDATE, 2 <GO> to send via <MESSAGE> OR <CANCEL> TO ABORT
 8/29/03 13:45 **PORTFOLIO TRADE** **TICKET# 131** 8/29/03
 Login Name **ROBERTSCOTT** Port **U1318838-1** Port Curr SF Cusip G2SF 1p*
 Port Name Private portfolio

Current Pos. **NONE** M Net Pos. **13750M**
 Unit Cost Avg Yld Unit Cost 101-20 Avg Yld 5.564

BUY **13,750.000M** **G2SF** **6** **TBA** **6%**

PRICE **101-20** assuming **PSA=300.0** **YIELD = 5.564%** **AL= 4.85yr**

Hand Priced ?

SETTLE **10/22/03** Wed Accrual Period 10/ 1/03 - 10/31/03 Monthly
 Next payment 11/20/03 (19 day delay)

Original Face \$ 13,750,000.00
 x Factor 1.000000000
 = current face \$ 13,750,000.00
 Principal value \$ 13,973,437.50
 + 21 days accrued \$ 48,125.00
 = total funds \$ 14,021,562.50

NOTES

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2003 Bloomberg L.P.
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2. A TBA Roll

GRAB Mtge **OPX**

8/29 7:59 **TBA ANALYSIS: GNSF** Page 3 of 4

GNSF 30-year For Month: **OCT**

CURRENT CALC., NOT "AS OF" CLOSE

Cpn	BGN MID		Chg	B.Median			-BMK- -Sprd- BPM Nov			Drops		
	8/28	Con		Yld	Prepay	WAM	WAL	Sprd-Chg	WAL "Z"		OAS	Roll%
1) 4 1/2	92-31	3-26	+ 28	5.59	125P	356	9.7	116/10-15	123	125	105	0.14
2) 5	96-25	2-30	+ 28	5.54	146P	355	8.9	111/10-16	135	129	103	-0.71
3) 5 1/2	99-23	2-07	+ 26	5.58	191P	352	7.4	115/10-17	170	151	112	0.10
4) 6	101-30	1-30	+ 22	5.54	282P	346	5.2	212/5	-19	210	182	0.36
5) 6 1/2	103-28	1-22	+ 12	5.12	428P	339	3.3	317/2	-14	250	186	1.29
6) 7	105-17	0-24	+ 08	4.40	553P	333	2.4	245/2	-13	225	147	1.57
7) 7 1/2	106-09	0-31	+ 05	4.26	602P	325	2.2	231/2	-9	224	145	1.96
8) 8	107-08		+ 00	4.26	603P	322	2.2	231/2	-2	224	145	2.66

O A S A S S U M P T I O N S

PREPAY SCALE VOLAT M.REV CURVE=DMT
 BPM 100% 15.0% 3% Const. Mtg Tsy Curve
 3-MO 6-MO 1-YR -2- -3- -4- -5- -7- -10- -20- -30-
 0.96 1.03 1.33 1.92 2.47 2.94 3.41 3.81 4.42 4.88 5.34

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 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2003 Bloomberg L.P.
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2. Replication performance*

- TBA only strategy averages 21 bps annual tracking error
- Large pool strategy averages 15 bps annual tracking error

Source: "Tradable proxy portfolios for the Lehman Brothers MBS Index", Lehman Brothers Fixed Income Research, July 2001



Figure 16. **Monthly Return Difference (bp), TBAs-Only Strategy versus the MBS Index, January 1994-May 2001**

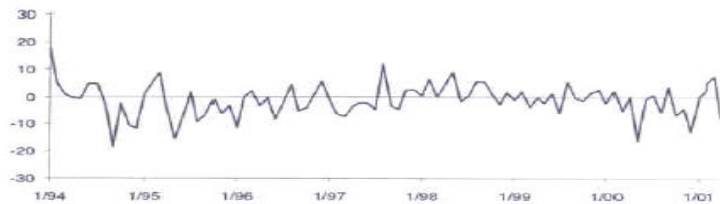
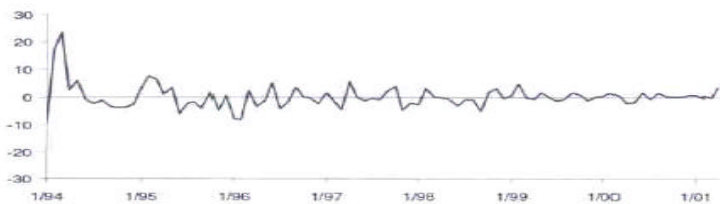


Figure 17. **Monthly Return Difference (bp), Large Pools-Only Strategy versus the MBS Index, January 1994-May 2001**



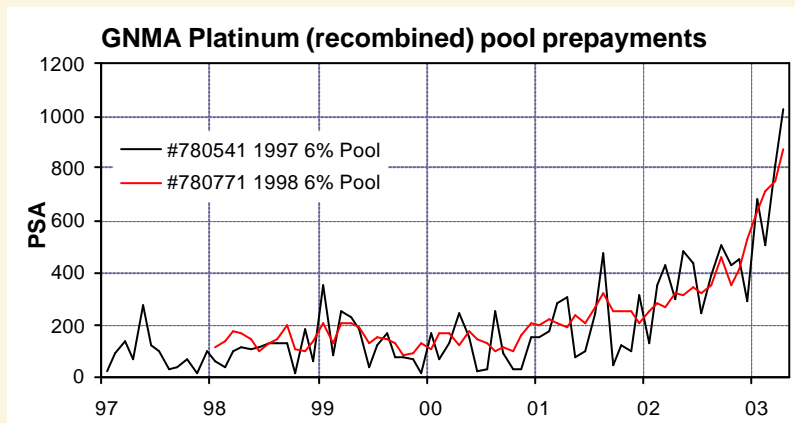


3. Relative value

- Bottom up or pool specific
- Top-down or Macro-driven

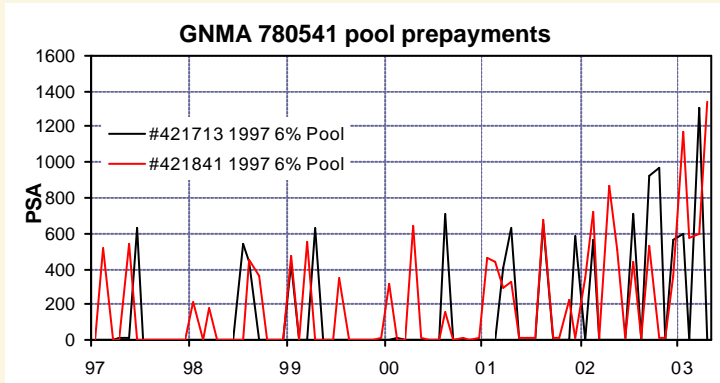


3. Relative Value Analysis – Pool Analysis





3. Pool makeup and prepayment speeds

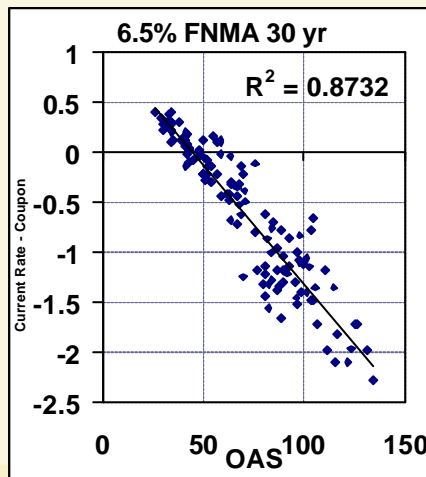
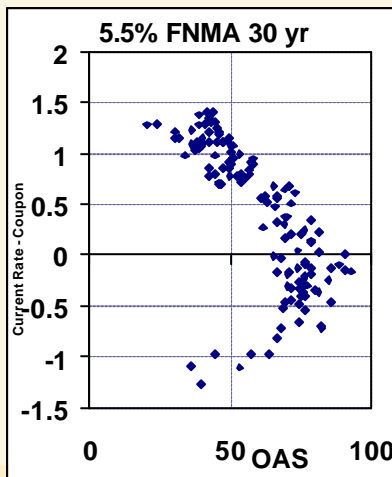


#421713 – 4% CA, 25% GA, 8% MD ...

#421841 – 25% CA, 29% GA, 16% MD ...

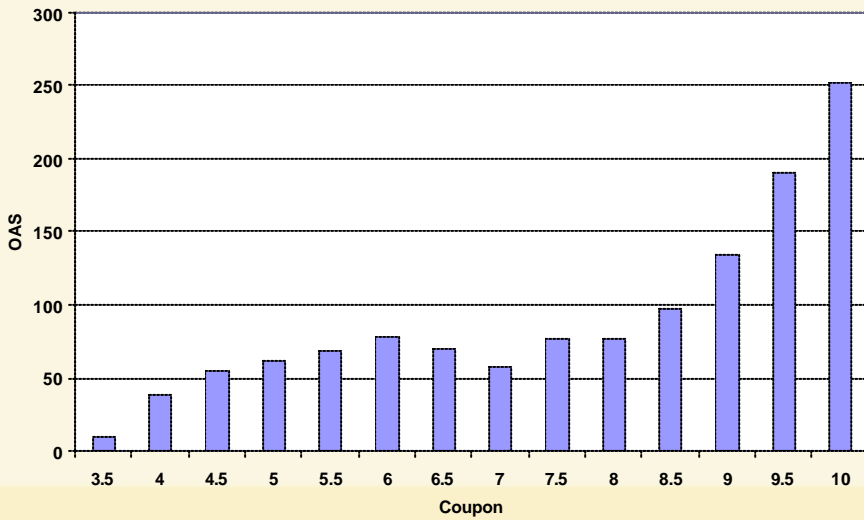


3. OAS and interest rates

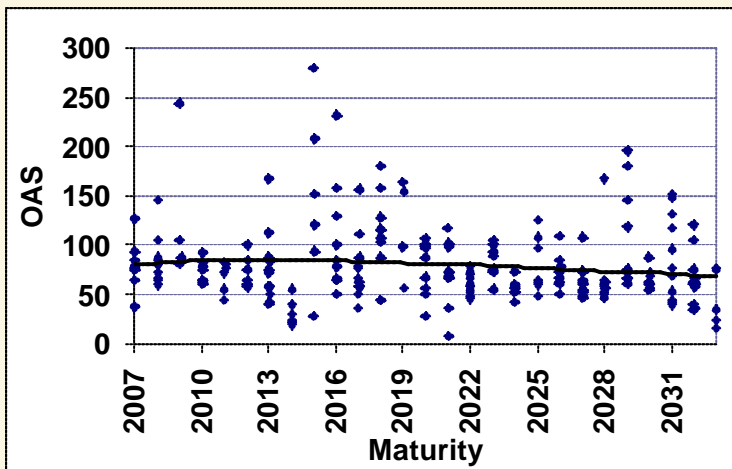




3. OAS - Cross sectional



3. OAS and maturity





In Summary

- Coupon, issue year, agency, program are important for classifying risks
- Duration as a risk measure, effective or empirical, requires assumptions
- TBA-only portfolio can reasonably replicate the Lehman MBS index
- Top-down or bottom-up analysis can be used for more active management



References

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