

# More MBS

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- Some terminology
- MBS's in BB
- TBA's
- Model vs. current mkt
- OAS and Z-spread

- WAC: Weighted Average Coupon
- WAM: Weighted Average Maturity
- CPR: Conditional Prepayment Rate (annualized rate)
- SMM: Single Month Mortality :  $CPR = (1 - (1 - SMM)^{12})$
- PSA: The Public Securities Association measures prepayment rates as a percent of the benchmark

$$\min(t/30, 1) \times 6\%$$

Ex. Suppose a pool is older than 30 months. Then the benchmark CPR is 6%. A PSA of 150% means that the prepayment rate is  $6 \times 1.5 = 9\%$ . A PSA of 50% gives a CPR of 3%.

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Security Description

Agency	FN	Issue Date	10/01/08	Originator	
Pool	992033	Mty Date	10/01/38	Wells Fargo Bank, N.A.	
CUSIP	31415XBAS			1 Home Campus , Des Moines IA 50328	
Type	(CL) Conventional Level pay				
Traits	30/360				
Generic	FNCL 6 2008			Coupon	6.000

Information As Of Apr10

						Prepayments					
							CPR	PSA			
WAC	6.375	Orig WAC	6.375	Factor	0.27987011						
WARM	339	Orig WAM	359	Orig Amt	324,100,399	1 Mon	62.5	1646			
WALA	19			Curr Amt	90,706,014	3 Mon	62.5	1733			
Curtailed	2					6 Mon	61.9	1860			
		WAOLT	360	AOLS	271,263	1 Year	60.1	2123			
		WAOLTV	77	WAOLS*	306,725	Life	56.7	2354			
# Loans	347	WAOCS	742	MAX LS	562,500	Geographics (Top 3)					
				Orig TPO	56.65	State	%UPB				
Delay	54 ( 24 )			Curr TPO	57.7	CA	21				
1 Month CPR	21)	More Historical Data			*Calculated Value	NJ	8				
						GA	7				
Apr10	Mar10	Feb10	Jan10	Dec09	Nov09	Oct09	Sep09	Aug09	Jul09	Jun09	May09
62.5	64.1	60.8	73.5	61.0	44.0	26.8	48.6	56.8	70.9	62.3	69.7

1) Summary 2) Generic 3) Prepay 4) Geo/LOY

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# Example BB screen

- WAC = 6.375, issue date = 10/1/2008, coupon (generic) = 6%.
- Pool is about 19 months old as of April 2010.
- "Factor" tells you how much principal is left. Here: 27.98%. So about 72% of the pool has repaid (most of which is refinancing)
- The SMM is about 6.5% (on average over the past 19 mos):

$$SMM = 1 - 0.2798^{\frac{1}{19}} = 1 - 0.9351 = 6.5\%$$

- The average CPR is

$$CPR = (1 - (1 - SMM)^{12}) = 55.3\%$$

BB reports it to be 56.7

(their computation is probably more accurate)

# CPR and PSA

BB reports 1 m CPR to 62.5% and PSA to 1646.  
This is for April, 2010 - 19 months after origination.

- The benchmark PSA is

$$6\% \times 19/30 = 3.8\%.$$

The current PSA should be about

$$62.5/3.8 = 1645$$

This compares to 1646 reported on BB.

Prepayment rates are high for two reasons:

- Loans were originated at close to 7% (6.37 + 70bp service fee) = 7.07
- Rates as of April 2010 average 5.15% (conforming 30 yr fixed)
- Defaults (note lot of loans in CA)

LLP

Mtge **DES**

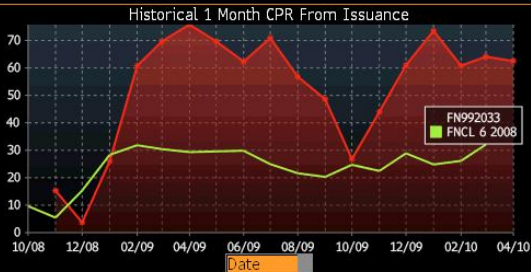
Security Description

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Information As Of Apr10

1 Month CPR History

Date	Pool	Generic
04/2010	62.5	
03/2010	64.1	32.1
02/2010	60.8	26.1
01/2010	73.5	24.8
12/2009	61.0	28.9
11/2009	44.0	22.5
10/2009	26.8	24.7
09/2009	48.6	20.3
08/2009	56.8	21.6
07/2009	70.9	24.9
06/2009	62.3	29.8
05/2009	69.7	29.6



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- TBA = To Be Announced is a market for generic pass-throughs.
- It is essentially a forward market, where the underlying is not specified until 2 days before delivery.
- Most trading in MBS take place in the TBA mkt
- BB screen (next page)
- Prices for 4.5 - 7% coupons, generical 30 year Fannie pass throughs w/ settlement May, Jun, Jul, etc.



<HELP> for explanation.

Mtge FIT

At 16:55 Op 100-09 Hi 100-17 Lo 100-09 Prev 100-08

Find Security 1) Markets 2) Workflow 3) Setup 4) Strategy FN30

FIT > TBA

\* Market Closed \*

	4.5		5.0		5.5	
May	100-15 / 16	2 - 3 + 08	103-09 / 10	4 - 4 + 07+	105-06 / 07	4 - 2 + 04
Jun	100-03 / 04	1 - 3 + 08+	102-28 / 29	4 - 3 + 07	105-02 / 03	2 - 3 + 04+
Jul	99-22+ / 23+	2 - 3 + 08	102-15+ / 16+	2 - 3 + 07+	104-22 / 23	2 - 4 + 05
May/Jun	12 <sup>1</sup> / <sub>4</sub> / 12+	3 - 4 --	12 <sup>3</sup> / <sub>8</sub> / 12 <sup>5</sup> / <sub>8</sub>	2 - 3 --	04 <sup>1</sup> / <sub>8</sub> / 04 <sup>3</sup> / <sub>8</sub>	3 - 2 - 00 <sup>1</sup> / <sub>4</sub>
Jun/Jul	12 <sup>1</sup> / <sub>8</sub> / 12 <sup>3</sup> / <sub>8</sub>	3 - 4 + 00 <sup>7</sup> / <sub>8</sub>	12+ / 13 <sup>1</sup> / <sub>4</sub>	2 - 2 --	11+ / 12+	3 - 2 - 00 <sup>3</sup> / <sub>8</sub>

	6.0		6.5		7.0	
May	106-22 / 23	1 - 1 + 02	108-03 / 04	2 - 1 + 02+	110-16+ / 17+	1 - 1 + 02+
Jun	106-13 / 14	1 - 1 + 02+	107-25+ / 26+	2 - 1 + 02	110-06+ / 07+	1 - 1 + 02+
Jul	105-30 / 04	1 - 1 + 02	107-10+ / 11+	1 - 1 - 02	109-26+ / 27+	1 - 1 --
May/Jun	09 <sup>1</sup> / <sub>8</sub> / 09 <sup>3</sup> / <sub>8</sub>	1 - 2 - 00 <sup>1</sup> / <sub>4</sub>	09 <sup>3</sup> / <sub>8</sub> / 09 <sup>5</sup> / <sub>8</sub>	1 - 2 + 00 <sup>1</sup> / <sub>8</sub>	/	-
Jun/Jul	08 <sup>7</sup> / <sub>8</sub> / 09 <sup>1</sup> / <sub>8</sub>	1 - 1 --	09+ / 10	1 - 1 - 00+	/	-

Benchmarks

Roll Analysis-FNCL

May/Jun

Rte

0.26

				Cpn	Cpr	Drp	B/E Drp	B/E Rte	B/E Cpr
Treas 2Y	100-00 / 00 <sup>1</sup> / <sub>4</sub>	1.000 / 996	+ 01	4.50	4.76	12.250	11.623	0.043	
Treas 3Y	100-15 <sup>1</sup> / <sub>4</sub> / 15+	1.586 / 583	+ 02+	5.00	14.93	12.375	11.619	0.007	6.458
Treas 5Y	100-00 <sup>3</sup> / <sub>4</sub> / 01	2.495 / 493	+ 07+	5.50	23.71	4.375	10.629	2.299	51.780
Treas 7Y	100-12+ / 13	3.187 / 184	+ 12	6.00	29.87	9.375	9.396	0.267	29.953
Treas 10Y	99-02 / 02+	3.739 / 738	+ 16+	6.50	82.46	9.375	-21.902	-8.516	30.015
Treas 30Y	100-03+ / 04+	4.618 / 616	+ 30+	7.00	90.43	-52.159	-52.159	0.261	90.430

TB30 TB15 FN30 FN15 GD30 GD15 GN30 GN15 SW30 SW15 BFLY Favorites

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# Putting our Excel model to test: Pricing current TBA's

Let's

- Assume that our (incorrect) prepayment model is in fact correct.
- Ignore the cheapest to deliver option imbedded in the TBA's
- Assume that the coupon rate is exactly what is specified in the TBA

- coupon (wac) = 4.5 gives 100.3. Mkt price is  $100+15/32=100.46$ .
- coupon = 5 gives 103.7. Mkt price is  $103+10/32=103.315$
- coupon = 5.5 gives 107.08. Mkt price is  $105+6/32=105.18$ .
- coupon = 6 gives 110.82. Mkt price is  $106+22/32=106.68$

See that as the coupon increases, our model overprices the MBS's.

WHY?

# A better prepayment model

...needs explicit dependence of the CPR on the difference between current and projected mortgage rates, and was because the larger the difference, the stronger the incentive to refinance

Let

$$d^*(t, Z) = \frac{1}{\prod_{s=1}^t (1 + f_s + Z)}$$

denote a discount factor where  $Z$  is some positive number and  $f_t$  is the time  $t$  forward rate extracted from the zero coupon yield curve (say).

Let  $E_0[CF_t]$  denote the expected cash flows from the MBS. The Z spread is the value of  $Z$  that solves

$$\text{mkt price} = \sum_{t=1}^T E_0[CF_t] d^*(t, Z)$$

Z spread is interpreted as “yield over treasuries” measure, but there is no real good theoretical reason for using this measure to select investments.

# Option Adjusted Spread (OAS)

Remember the mother of all valuation formulas

$$P_{theory} = E^* \left[ \sum_{t=1}^T \frac{CF_t}{\prod_{s=1}^t (1 + r_s)} \right]$$

The OAS is the value of  $X$  that solves

$$P_{mkt} = E \left[ \sum_{t=1}^T \frac{CF_t}{\prod_{s=1}^t (1 + r_s + X)} \right]$$

The OAS represents a yield premium over comparable treasuries.

It effectively maps the difference between the mkt and model prices into a return.



From TBA, right click on a price to get a generic model pricing screen. Now fill in the various modeling assumptions, including the observed mkt price. Lets choose FNMA 4.5%. Make sure wac is set to 4.5. Set the price to 100-15.

This gives  $OAS=18.3BP$  This of course assumes BB's

prepayment model (which is?), which again assumes a particular interest rate model (which is?) certain values of *speed of mean reversion* and correlation between the two factors in the model, etc.

Mtge **OASN**

1<GO> to Refresh, 5<GO> to Re-calculate, 7<GO> for historical OASN records

**Bloomberg** **OAS ANALYSIS** 270/big1 3.149  
 Prepayment Model

**FNCL 4.5 5/10** WAM: 356 WAC: 4.50 Age: 0  
 (as of Apr10)

CUSIP: 01F042657

Settle: 5/13/10 Calc: OAS Price 100-15 OAS 18.3 % Vol OAS 62.5 Option Cost 44.2

Eff Dur 5.8 Eff Cnv -1.8 Sprd Dur 6.4 + 25bp Px 98-30+ - 25bp Px 101-27<sup>3</sup> Std Dev 10.86 Vega -0.42

Assumptions	4/21/10	2) Expand Yield Curve	3) Expand Swaption Vol
Interest Rate Model	Model: 2-Factor LGM	S23 Shift: 0bp	VCUB: USD Bloomberg Cube
Simulation Paths:	256	As of 4/21/10	Shift: 0.00
Mean Reversion 1:	3%		
Correlation:	-0.70		
Prepayment Model	Model@Scale: BPM@100.00%		
Model Parameter:	Implicit		
	MTGEFNCL 4.431		
LTV:			
CrSc:			
Own:			
LnSz:			

Term	Rate
3 Mo	0.313
6 Mo	0.472
1 Yr	0.952
2 Yr	1.159
3 Yr	1.748
4 Yr	2.249
5 Yr	2.651
7 Yr	3.233
10 Yr	3.733
20 Yr	4.321
30 Yr	4.444

Term	2 Yr	10 Yr
1 Mo	58.95	23.90
3 Mo	54.90	24.85
6 Mo	55.90	25.45
9 Mo	52.75	25.95
1 Yr	47.75	25.30
2 Yr	34.80	23.90
3 Yr	28.50	22.30
4 Yr	24.90	21.10
5 Yr	22.60	20.30
6 Yr	22.50	19.65

Eff Calc Vol: Normal

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Figure: OAS analysis in Bloomberg