Lakhbir Hayre
(212) 783-6349
lhayre@sbi.com

Debashis Bhattacharya
(212) 783-7608
bhattacharya@sbi.com

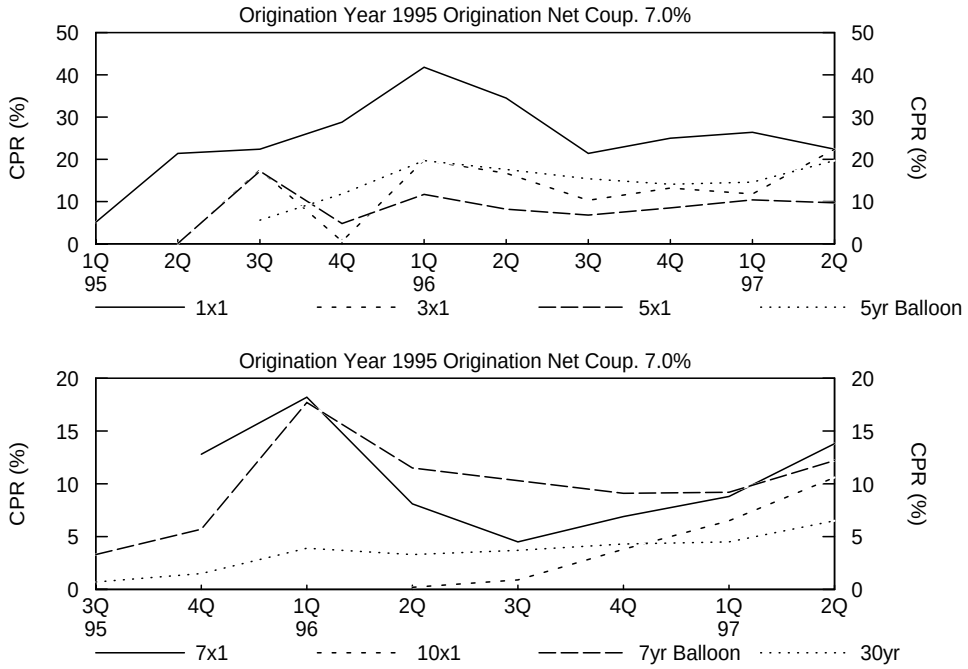
Analysis of Hybrid ARMs

Over the last few years, hybrids have become one of the most popular sectors of the ARMs market [10] . Salomon Brothers has developed a prepayment model for hybrid ARMs, which is now available on the *Yield Book*. This article gives a brief description of the model and its implications.

Characteristics of Hybrid Speeds. Figure 1 show speeds on selected hybrid ARMs grouped by origination year and initial net coupon. For comparison, we also show speeds on traditional one-year conventional ARMs and on five-year and seven-year balloons and 30-year fixed rate coupons from the same vintage and with the same initial coupon.

[10] See *Bond Market Roundup: Strategy*, September 27, 1996.

Figure 1. Speeds on 1995 Origination ARMs, Balloons, and 30-Year Coupons



Source: Salomon Brothers Inc.

Some clear patterns emerge from historical prepayment data such as that shown in Figure 1:

• Speeds seem to be slower the longer the first reset period.

• Although 3x1 ARMs are often considered to be similar to traditional one-year ARMs, they in fact are much slower, with speeds that are typically less than half those of one-year ARMs.

• 5x1s are slower than 3x1s, and also slower than five-year balloons, a product with which they are often compared. Similarly, 7x1s appear slower than seven-year balloons.

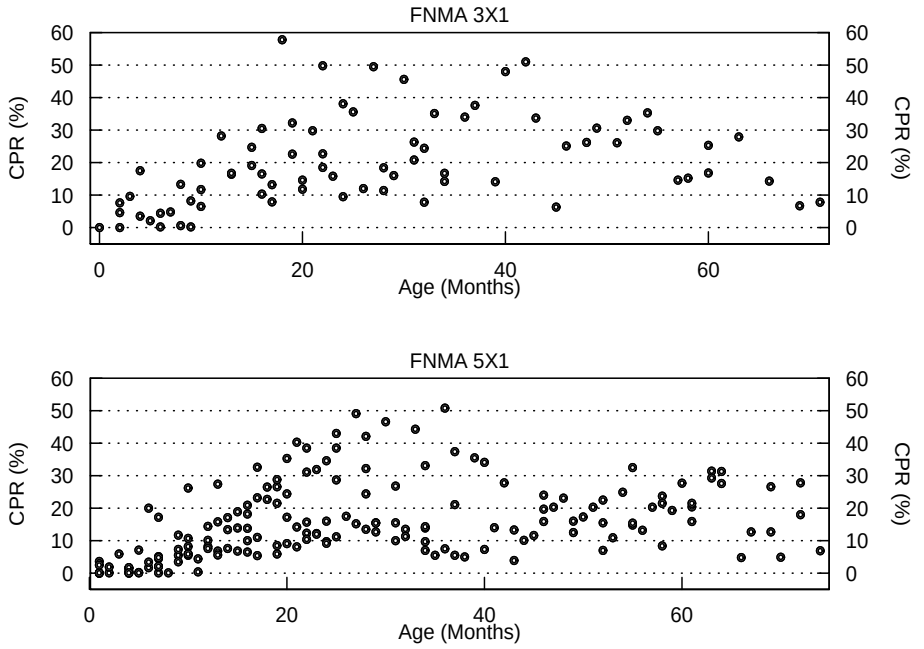
• 10x1s are slowest among the hybrids, but seem slightly faster than standard 30-year fixed-rate loans.

It is clear from the data that there are basic differences in terms of prepayment propensities between borrowers taking out various types of ARMs. For example, opportunistic refinancers, who take out a teasered ARM and refinance into another teasered ARM when their coupon starts resetting upward will mostly likely take out a one-year ARM, as this offers the lowest rate. Hence, 3x1 or 5x1 ARMs, for example, do not start prepaying like one-year ARMs when they reach their first reset, as we discuss next[11] .

Do Hybrid ARM Speeds Spike After the First Reset ? Past data suggest that such spikes have been fairly muted, as indicated by Figure 2, which shows historical speeds on 3x1 and 5x1 ARMs by loan age.

[11] In fact, one reason why one-year ARMs have had such fast speeds in the last few years may be that the increase in hybrid issuance has resulted in a higher concentration of opportunistic refinancers among borrowers still taking out one-year ARMs.

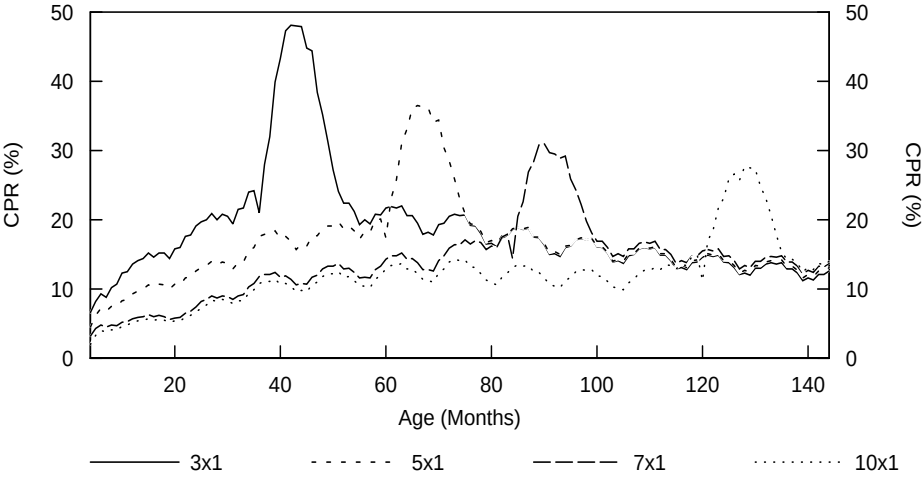
Figure 2. Historical Speeds Do Not Suggest a Big Spike in Hybrid Speeds After First Reset



Source: Salomon Brothers Inc.

Even though historical data do not point to a huge spike in speeds after the first reset, the possibility of such a spike continues to be a concern to investors. The concern arises from the fact that the historical data are somewhat limited, since most hybrid ARMs have not yet reached their first reset. Furthermore, lenders may be more proactive in refinancing hybrid borrowers going forward. We are somewhat agnostic on this issue, but recognizing the validity of these concerns, we have chosen to build into our model a higher spike at the first reset than is indicated by historical data. Figure 3 shows model projections for new hybrids — for simplicity, we assume that all the ARMs have an initial WAC of 7.25% and a gross margin of 300bp.

Figure 3. Projected Speeds on New Hybrid ARMs (Gross Coupon: 7.25%, Gross Margin: 300bp, Age: 4 Months)



Note: Projections assume unchanged rates with the one-year Treasury (the index) at 5.56%.
Source: Salomon Brothers Inc.

For 3x1 hybrids, for example, speeds are projected to increase to about 20% to 25% CPR by age 30 months, and then spike to about 45% to 50% CPR after month 36, before declining back to about 20% CPR by about month 50. The spikes become less pronounced the longer the first reset.

Figure 4 gives one-year and long-term prepayment projections in differed interest-rate scenarios for selected hybrid ARMs, bucketed by origination year and original coupon — also shown are recent actual speeds. Generally speaking, our base case long-term projections average about 20% CPR for 3x1s, about 16% to 17% CPR for 5x1s, and between 13% to 15% CPR for 7x1s and 10x1s (projections are slightly lower for very new coupons) — thus, projections are higher than the 12% CPR market convention that is often used.

Figure 4. One-Year and Long-Term Projections on Hybrid ARMs

Orig. Net Cpn.	Orig. Year	WAC OR/CR	WAM	AGE	Actual Speeds One Year	Three Month	One Month	Projected Speeds -200 1-Yr.	-200 L-T	-100 1-Yr.	-100 L-T	0 1-Yr.	0 L-T	+100 1-Yr.	+100 L-T	+200 1-Yr.	+200 L-T
3x1																	
6.5	1994	7.4/7.0	27-02	34	14.1	20.6	28.6	54.1	37.2	48.7	30.9	33.1	20.1	23.7	18.7	20.3	17.7
6.0	1995	6.9/6.8	28-02	21	16.0	19.8	21.3	44.9	34.0	37.8	29.2	19.5	20.6	16.1	19.5	13.4	18.5
7.0	1996	7.5/7.6	28-10	14	8.4	10.2	9.8	47.1	34.6	37.3	27.6	17.9	20.0	14.4	18.9	11.6	18.2
5x1																	
7.0	1991	8.0/8.0	24-05	67	19.4	26.0	21.3	46.7	32.8	36.3	22.4	21.9	14.5	21.8	13.6	18.7	12.5
6.5	1993	6.9/7.0	26-05	43	10.9	14.8	16.8	49.5	37.8	39.8	28.0	18.5	17.0	15.8	15.7	14.0	14.6
6.5	1994	7.2/7.2	27-00	36	12.3	10.8	17.5	50.6	37.5	41.9	28.9	17.8	17.1	14.9	15.4	12.4	14.6
7.0	1995	7.8/7.6	27-07	29	8.9	9.7	10.9	52.1	37.0	43.5	29.2	18.1	17.3	14.3	15.6	11.6	14.6
6.5	1996	7.1/7.2	28-08	16	4.8	7.4	8.2	44.7	35.0	29.6	24.6	11.8	15.9	8.9	14.3	7.0	13.5
7x1																	
7.5	1994	8.0/8.0	27-00	36	11.3	11.6	9.8	58.1	45.4	47.8	31.8	15.3	14.2	11.2	12.2	9.1	11.1
7.5	1995	7.8/8.0	27-07	29	9.4	11.4	11.8	57.7	45.2	47.1	32.6	14.3	15.0	10.1	13.0	7.9	11.4
7.5	1996	8.0/8.0	28-07	17	6.5	5.2	5.6	53.5	43.8	40.4	29.6	10.1	14.1	6.8	12.3	5.9	10.9
10x1																	
7.5	1994	8.2/8.1	27-02	34	10.2	13.1	13.0	58.2	46.4	47.2	32.4	15.1	13.2	10.4	10.9	8.1	9.5
7.5	1995	8.2/8.1	27-10	26	8.8	9.3	9.9	56.6	45.4	45.1	31.8	12.9	13.4	8.8	11.0	6.8	9.5
6.5	1996	7.3/7.3	29-02	9	2.3	8.8	22.5	44.1	37.0	26.2	21.3	5.7	10.6	4.3	8.9	3.1	8.2

Note: OR = original, CR = current
Source: Salomon Brothers Inc.

Valuation of Hybrid ARMs. Hybrid ARMs are generally compared to balloons, and the usual way to value them is to assume a balloon payment at the first reset date, with a put price of 100 or 101. Our prepayment model indicates that this approach understates the value of hybrids, and that hybrids offer OASs that are typically 20bp to 30bp wider than on balloons.

As an example, Figure 5 shows an analysis for FNMA 5x1 hybrid pool 376102.

Figure 5. Analysis of 5x1 Hybrid FNMA Pool 376102

Coupon	WAC	WAM	Price	Projected CPR 1 yr.	Projected CPR LT	OAS	Opt. Cost	Eff. Dur.	Eff. Conv.
6.87%	7.55%	29-07	100-28+	10.9%	14.8%	48	40	2.8	-1.0

Note: Pool has a net margin of 208bp, gross margin of 275bp, life cap of 12.87%, periodic caps of 2%, and 56 months to first reset. Index is 5.56%
Source: Salomon Brothers Inc.

Sensitivity to Prepayment Assumptions. Given the uncertainty concerning prepayments on hybrids, especially after the first reset, we show in Figure 6 the effect on the OAS of hybrid pool 376102 if speeds spike much higher after the first reset than assumed by our base model. Our model

projects that speeds will spike to about 34% CPR after the first reset. We adjust the model to increase this spike: in Figure 6, the "fast" model has speeds spiking to about 47% CPR after the first reset, while the "faster" model has speeds peaking at about 63% CPR.

Figure 6. Prepayment Sensitivity of 5x1 Hybrid FNMA Pool 376102

	Projected CPR				Option	Eff.	Eff.
	Peak	LT	Price	OAS	Cost	Dur.	Conv.
Base Model	33.5%	14.8%	100-28+	48	40	2.8	-1.0
Fast Model	47.0	16.5	100-28+	39	41	2.7	-1.0
Faster Model	62.8	18.3	100-28+	29	44	2.6	-1.1

Note: The peak speed refers to the maximum projected speed after the first reset date (56 months from now). The long-term speed is the WAL-equivalent CPR of the vector of projected speeds from now until maturity.
Source: Salomon Brothers Inc.

The pool loses OAS for faster projected speeds, but even under a fairly severe assumption of speeds above 60% CPR after the first reset, the OAS is still 5bp-10bp higher than those currently offered by balloons.

Exit Price and Comparison to Balloons. Why is pool 376102 worth 20bp-30bp OAS more than a comparable balloon? A simple way of analyzing this is to note that at the first reset date in 56 months, assuming unchanged rates, the hybrid will reset to a fully indexed coupon of the one-year Treasury rate plus the net margin 2.08%, or (5.56% +2.08%), which is 7.64%, an increase of 77bp over the current coupon. This implies that since it is priced at 100-28+ now, it will be worth even more after it's first reset (depending on prepayments — more on this below). In contrast, a five-year balloon will return principal at par after five years, and in addition is expected to have faster speeds in the interim.

A more formal analysis is given in Figure 7. The price of the hybrid is calculated **just after the first reset date** (i.e., 56 months from now, when the ARM is seasoned five years) assuming unchanged interest rates and an unchanged OAS. We use both the base model and the faster models defined above.

Figure 7. Exit Price of 5x1 Hybrid Pool 376102 After First Coupon Reset

				Projected CPR (%)				
	Coupon	WAC	WAM	Peak	1-Year	LT	OAS	Price
Base Model	7.64%	8.31%	24-11	33.5	30.8	17.5	48	103.990
Fast Model	7.64	8.31	24-11	47.0	42.8	21.3	48	103.309
Faster Model	7.64	8.31	24-11	62.8	53.2	24.8	48	102.893

Note: Pool has 11 months to roll. Index value is 5.56%
Source: Salomon Brothers Inc.

Even under fairly severe prepayment assumptions, the price of the hybrid ARM is still projected to be close to 103, much higher than the 100 or 101 put prices typically assumed by market convention when valuing hybrids.

One caveat: the price of the hybrid is higher than what would be projected for a fixed-rate MBS with a comparable coupon. This is because the option cost of the hybrid ARM is much lower. While the hybrid is assumed to have speeds comparable to fixed-rate MBSs if rates decline (see Figure 4), it is assumed to slow down less if rates rise, with long-term speeds still in double digits even if rates rise several 100bp. While this can be justified by the double-digit speeds on conventional ARMs in the late 1980s, when mortgage rates were over 10%, it is an assumption that investors need to be aware of.

Summary. A prepayment model for hybrid ARMs developed by Salomon Brothers indicates that the sector is cheap relative to comparable products. A dearth of historical prepayment data, though, lead to uncertainty about likely speeds after the ARMs start resetting. However, hybrids still seem to offer value even under much more severe prepayment assumptions than indicated by historical data.