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Coupon Dispersion in Hybrid ARMs

In the past investors have expressed concern about coupon[6] dispersion in hybrid ARM pools. These concerns are based on the following factors:

- The agencies allow a wide dispersion of coupons in a pool (in some cases close to 200bp).
- The actual weighted-average coupons drift from month to month as a result of uneven prepays from the different gross WAC groups. For modeling purposes, the weighted-average coupon is sometimes held constant. This might result in mispricing of the pool.[7]

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[6] We use "coupon" to refer to the net coupon of a pool throughout this article.

[7] For example, a mega-pool of 6.5% may be constituted of two equally weighted subpools of 7% and 6% coupons. By the end of the first initial reset, if the subpools have 30% and 70% weights, respectively, owing to different prepay rates, the net coupon would have drifted to 6.3%. At that time, assuming the one-year CMT rate of 6% and a net margin of 2%, both the subpools will reset to 8%. Sometimes, for computational efficiency, the mega-pool might be run as a 6.5% coupon throughout the reset period and would also reset to 8%. Hence, the coupons might tend to drift between reset periods and longer initial reset can cause mispricings. Although this might not always be the case, our objective is to discuss some possible conservative scenarios.

We do a simple exercise of breaking down a mega-pool into its constituent subpools. We then price the mega-pool (as one coupon) and a weighted portfolio of individual coupons under similar pricing assumptions. The difference in theoretical prices indicates the extent of mispricing caused by coupon dispersion.

Methodology

To keep the exercise simple, we use a barbell of coupons to simulate the price differentials. For example, 6% and 7% subpools can be weighted equally to create a 6.5% mega-pool to simulate a 100bp coupon dispersion (a 6.5% mega-pool can also be created from a 6.25% and a 6.75% subpool).

We price seven coupons in the range of 6%–7.5%. We then compare the price of each of these coupons to as many equally-weighted coupon portfolios as we can create. For example, the price of the 6.5% coupon can be compared to the portfolios mentioned above — 6% with 7% (100bp dispersion) and 6.25% with 6.75% (50bp dispersion).

We run the same exercise at 100% of the model at constant OAS and also under a constant DM with pricing CPR assumptions.

Results

We present the results in Figure 24 (100% model/constant OAS assumptions) and Figure 25 (pricing CPR/constant DM assumptions).

For example, in Figure 24 for the case of 150bp dispersion, if the 6.0% and 7.50% subpools were individually priced and equally weighted, the average price for the 6.75% portfolio would have been (93.609 + 98.523)/2 = 96.066. This is about 4 1/2 ticks lower than 96.204, the price of the individual 6.75% coupon.

As the results show, the impact of a dispersion less than 100bp is not significant even for the higher coupons. Also, the impact under the constant CPR assumption is slightly less in general, indicating the speeds around reset of coupons (as captured in the prepay model) can increase the extent of mispricing. Also, we get similar results even at 120% to 130% of the market.

Figure 24. Impact of Coupon Dispersion on Pricing of 5X1 Hybrid ARMs (100% of the Model/120bp OAS), as of 24 May 00

	Price at	(Projected CPR %)		Coupon Dispersion		
Coupon (%)	120bp OAS	1 Yr	LT	50bp	100bp	150bp
6.00	93.609	3.5	14.0			
				6.00/6.50		
6.25	94.496	3.8	14.4	-0.010		
				6.25/6.75	6.00/7.00	
6.50	95.364	4.3	14.6	-0.014	-0.050	
				6.50/7.00	6.25/7.25	6.00/7.50
6.75	96.204	4.8	14.8	-0.013	-0.055	-0.138
				6.75/7.25	6.50/7.50	
7.00	97.019	5.3	14.9	-0.016	-0.076	
				7.00/7.50		
7.25	97.802	6.0	15.3	-0.031		
7.50	98.523	7.3	16.2			

Hybrid ARMS used have 60 months to roll, 225bp net margin and 300bp gross margin.
Source: Salomon Smith Barney.

Figure 25. Impact of Coupon Dispersion on Pricing of 5X1 Hybrid ARMs (Constant %CPR/180bp DM), as of 24 May 00

	Price at	(Constant CPR %)		Coupon Dispersion		
Coupon (%)	180bp DM	1 Yr	LT	50bp	100bp	150bp
6.00	94.744	14.0	14.0			
				6.00/6.50		
6.25	95.545	14.5	14.5	-0.032		
				6.25/6.75	6.00/7.00	
6.50	96.282	15.0	15.0	-0.018	-0.074	
				6.50/7.00	6.25/7.25	6.00/7.50
6.75	96.983	15.5	15.5	-0.006	-0.044	-0.127
				6.75/7.25	6.50/7.50	
7.00	97.672	16.5	16.5	-0.014	-0.047	
				7.00/7.50		
7.25	98.333	17.5	17.5	-0.013		
7.50	98.968	18.5	18.5			

Hybrid ARMS used have 60 months to roll, 220bp net margin and 277bp gross margin.
Source: Salomon Smith Barney.

Notes (Minor Details)

➤ The portfolio of coupons will capture the coupon drift because each subpool will pay down at a different rate and the portfolio price will automatically incorporate the weighted-average coupon outstanding at any point in time.

➤ The individual coupon price is different from the price of the portfolio because of the negative convexity caused by prepayments (price rises less than proportionately with coupon). Prices would be almost linear in coupons were the cash flows to follow the scheduled amortization — the differences are mostly due to higher prepay rates for premiums.

➤ In general for a pool with 50bp-100bp of coupon dispersion, the effect may not be great in the current rate environment. However, when the coupon stack is mostly premium (with aggressive prepay assumptions) and the dispersions are much higher, the effect will be larger.

- Two subpools can be weighted in infinitely many ways to create a mega-pool. However, an equal weight for the two subpools is a conservative assumption and captures close to the maximum price difference that a portfolio of two coupons can generate (e.g., in an extreme case, if the entire weight was on one subpool, there will be no difference in price). Also, it can be shown from a simple concave (negatively convex) curve, $y = x^{0.5}$, that the maximum value for $[w*x1 + (1 - w)*x2]^{0.5} - [w*x1^{0.5} + (1 - w)*x2^{0.5}]$ is attained at close to $w = 0.5$ for $0 \le w \le 1$, x1 and x2 being the two extreme points.

- In reality, a pool will have many more than two coupons. A quick way to use the results above might be to create a list of coupons sorted by percentage weight, create barbells of adjacent coupons, estimate the mispricing for each barbell, and then move on to the next layer of barbells with the weighted-average coupons from the first level and so on.

Unfortunately, dispersion in rolls is independent of the problem of dispersion in coupons. We will write a follow-up article in the future