Prepayment Rate Assumptions – The Difference between CPR and PSA

When evaluating a mortgage security, there are three inputs needed; the security characteristics (coupon, term, structure, etc.), the price and the prepayment assumption. Markets have adopted two main benchmark methods that are used to calculate prepayment assumptions, CPR, which stands for Conditional Prepayment Rate and PSA, which stands for Public Securities Association. This article will explain the difference between the two methods.

The CPR is the percentage of mortgage security principal that is assumed to be paid off ahead of time each year. CPR is expressed as an annual percentage and measures prepayments as a percentage of the current outstanding principal balance. For example, 12% CPR means that 12% of the outstanding principal balance is projected to prepay over the next year and each year thereafter. The CPR is calculated from the SMM (Single Month Mortality) which is just the actual percentage of prepayment for 1 month. For example, if the SMM is .01, then the CPR is calculated as follows:

1 - (1 - SMM)^12 = CPR OR 1 - (1 - **.01**)^12 = **11.36%**

Note that .01 SMM does not exactly equal 12% CPR due to the compounding (1% on a declining balance each month), but rather 11.36%. To get to exactly 12% CPR, the SMM would need to be slightly higher as follows:

1 - (1 - CPR)^(1/12) = SMM OR 1 - (1 - **.12**)^(1/12) = **1.06%**

PSA uses CPR to calculate prepayments but the difference is PSA incorporates a seasoning curve for the first 30 months of the security life. PSA is quoted in percent and that percent represents the multiplier to use for the CPRs in each period in the Base PSA curve (Exhibit 1). The base PSA curve is 100% PSA. At month 30, the seasoning curve stops and 100% PSA is the same as 6% CPR going forward so the assumption is 6% CPR from months 30 to 360. At 200% PSA, the CPRs in the first column (100% PSA or Base PSA curve) are multiplied by 2 and 200% PSA is the same as 12% CPR beginning with month 30 and forward.

Exhibit 1

Monthly Period	100% PSA	200% PSA	300% PSA
1	***0.20%***	0.40%	0.60%
2	0.40%	0.80%	1.20%
3	0.60%	1.20%	1.80%
4	0.80%	1.60%	2.40%
5	1.00%	2.00%	3.00%
6	1.20%	***2.40%***	3.60%
7	1.40%	2.80%	4.20%
8	1.60%	3.20%	4.80%
9	1.80%	3.60%	5.40%
10	2.00%	4.00%	6.00%

11	2.20%	4.40%	6.60%
12	2.40%	4.80%	7.20%
13	2.60%	5.20%	7.80%
14	2.80%	5.60%	8.40%
15	***3.00%***	6.00%	9.00%
16	3.20%	6.40%	9.60%
17	3.40%	6.80%	10.20%
18	3.60%	7.20%	10.80%
19	3.80%	7.60%	11.40%
20	4.00%	8.00%	12.00%
21	4.20%	8.40%	12.60%
22	4.40%	8.80%	13.20%
23	4.60%	9.20%	13.80%
24	4.80%	9.60%	14.40%
25	5.00%	10.00%	15.00%
26	5.20%	10.40%	15.60%
27	5.40%	10.80%	16.20%
28	5.60%	11.20%	16.80%
29	5.80%	11.60%	17.40%
30	***6.00%***	***12.00%***	18.00%
31	6.00%	12.00%	18.00%
32	6.00%	12.00%	18.00%
33	6.00%	12.00%	18.00%

Where a mortgage security starts on the PSA curve is based on the security's WALA, or weighted average loan age. For example, if a security had a WALA of 6 months and was priced at 200% PSA, then the CPR assumption for the first month would be 2.40%, then 2.80% and so on.

Regardless of where a security is in the PSA schedule, you can always take the PSA percentage and multiply it by .06 to quickly get the long-term CPR assumption. For example, 200% * .06 = 12%.

When looking at reported prepayment speeds, such as on Bloomberg, if a security has a WALA of 30 months or later then the CPR / .06 = PSA for that month. For example, if the CPR reported for the last month is 30%, then the PSA will be reported as 500% (.30 / .06). However, if the security has a WALA of <30, the PSA that is reported for that month will be calculated based on the CPR at the security's WALA. For example, if a security has a 15 month WALA and prepays at 30% CPR for that month, the PSA for that month will be reported as 1000% (.30/.03) since 3.00% is the CPR for month 15 in the base PSA curve.

Exhibit 2

Source: Bloomberg L.P.

Whether you are running PSA or CPR will have an effect on the yield of the security. The FN pool in Exhibit 2 has a yield of 1.6887% at a price of 104-00 using 300 PSA. Remember that the long term CPR for 300 PSA beginning in month 30 is 18% (300 * .06) but if you just run just a straight 18% CPR you get a yield of 1.5217%, lower by 16 bps. The difference is that the CPRs are ramping up from months 1-30 using PSA but there is no ramp using just a straight 18% CPR so faster prepayment assumptions at a premium dollar price equate to a lower yield. Notice also that average life contracts by almost a full year at 18% CPR vs. 300 PSA. Finally, note that to get to the same yield as 300 PSA, the straight CPR assumption would have to drop to 14.3%.

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