



Benchmark CPR

Methodology Overview

March 2020

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An Opportunity to Develop a Complementary Metric: Introducing the Benchmark CPR™

Since we issued our first Mortgage-Backed Security (MBS) in 1981, Fannie Mae has been meeting the nation's mortgage liquidity needs by offering a security that is attractive to investors because of its dependable cash flows. To achieve this, Fannie Mae sets standards and actively reviews market practices that best contribute to reliable prepayment speeds. The recent launch of the Uniform Mortgage-Backed Security (UMBS®) has introduced an additional requirement for prepayment alignment between Fannie Mae's and Freddie Mac's¹ securities. As part of our continuous efforts to manage prepayment speeds more effectively, Fannie Mae developed our Benchmark CPR framework to facilitate proactive engagement with sellers and servicers. By its nature, this framework is flexible, allowing Fannie Mae to adapt to changing market conditions.

For Fannie Mae to manage our Single-Family business in a safe and sound manner, it is essential to have a unified metric that monitors entity-level prepayment speeds in relation to the cohort. Since late 2019, sellers and servicers have been able to track their own performance according to the Benchmark CPR framework — as well as that of other Fannie Mae sellers and servicers — on our seller/servicer reporting portal. The introduction of one consistent metric has resulted in simplified engagement with Fannie Mae as it relates to prepayment speeds. This has helped align expectations and mitigate confusion that could otherwise occur when referencing multiple metrics.

We are making our Benchmark CPR surveillance framework available to all market participants by launching the Benchmark CPR dashboard on [Data Dynamics®](#), our free online analytics platform. Fannie Mae believes that transparency reinforces our ability to promote behavior that contributes to the liquidity and vitality of the MBS market. The Benchmark CPR dashboard allows all market participants including investors, sellers, and servicers to monitor prepayment speeds through the same lens as Fannie Mae, which we hope will align expectations and enhance confidence in cashflow predictability. Fannie Mae uses public monthly prepayment data to calculate the Benchmark CPR, enabling market participants to replicate the methodology and results.

Our Benchmark CPR framework builds upon the familiar market concept of the Conditional Prepayment Rate (CPR) by defining the reference population using a 24-month rolling issuance window rather than a vintage cohort. There are several limitations with existing prepayment metrics used by market participants that this methodology seeks to address:

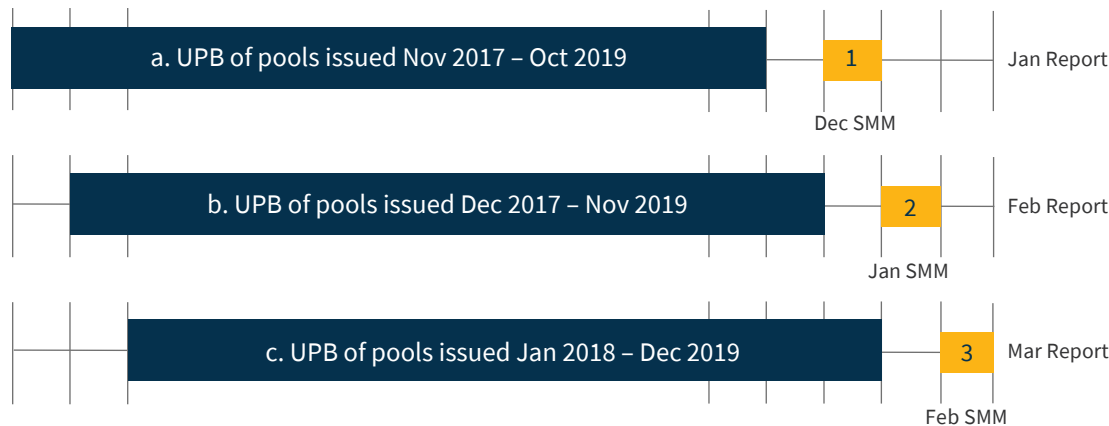
- **Cohort by vintage:** One of the most common practices is to cohort by vintage. By construction, the population of loans included in the most recent vintage cohort grows over the course of that year, resulting in inconsistent month-over-month comparisons. Prepayment trends may span more than one vintage, so a year-end cutoff in the population may produce a distorted view of prepayment when viewed in isolation.

1. Collectively, the government-sponsored enterprises, or GSEs.

- **Servicing transfers:** Existing prepayment methodologies have not universally incorporated servicing transfers into the calculations, which could distort the prepayment speeds of a servicer during a month of servicing sales or acquisitions.

Our solution is designed to address each of these limitations and to enable more proactive engagement with our seller and servicer partners regarding their business practices.

Exhibit 1. Components of the 3-Month Benchmark CPR



$$\text{Feb SMM3} = \frac{[a \times 1] + [b \times 2] + [c \times 3]}{a + b + c}$$

$$\text{Feb Benchmark CPR3} = 1 - (1 - \text{Feb SMM3})^{12}$$

$$\text{Feb SMM3} = 1 - (1 - \text{Feb Benchmark CPR})^{1/12}$$

Note: UPB in Exhibit 1 refers to scheduled UPB for the reference population at the end of the observation period. For example, the scheduled UPB for reference population (a) above would be measured on December 31, 2019.

Defining the Benchmark CPR

The Benchmark CPR is calculated from the weighted average of one-month single monthly mortality (SMM) rates for a reference population of loans defined by a 24-month rolling issuance window. As shown in Exhibit 1 above, our flagship metric is the Benchmark CPR3, which is calculated from the three-month weighted average SMM. The number of months covered by each issuance window (represented by the dark blue boxes in Exhibit 1) is always fixed (in this case, at 24 months). As a result, the weighted average seasoning of the reference population for every Benchmark CPR observation is generally stable.² All loans in each issuance window are at least two months seasoned at the beginning of each observation period (represented by the yellow box), allowing us to capture speeds further up the seasoning ramp. Requiring at least two months of seasoning ensures that each loan has at least three prepayment opportunities captured in the Benchmark CPR metric.³ For more details on the methodology, please see [Appendix B](#).

2. The reference population is comprised of 30-year fixed-rate loans pooled across all coupons, including specified pools, and issued during the issuance window. Limited to loans pooled in UMBS and pre-UMBS Fannie Mae CL prefixes and the pre-UMBS Freddie Mac equivalents. Excludes loans pooled in jumbo conforming, modified, HARP, or other prefixes.

3. For example, December issuance would have the opportunity to prepay in Dec 2019, Jan 2020, and Feb 2020 when it appears in the February Benchmark CPR.

Prepayments for each observation month are attributed to the servicer of record at the beginning of that observation month, ensuring that transfers of servicing are consistently accounted for. Similarly, loans in the reference population are attributed to the servicing seller at the time of pooling. Finally, as note rate differences among sellers and servicers may impact relative prepayment performance, we normalize the cohort's profile to each entity. To make this adjustment, we reweight the cohort's SMMs by note rate to match the entity's note rate distribution and recalculate the entity's percentage of cohort, which we refer to as the note rate-adjusted Benchmark CPR ratio.

Exhibit 2. Benchmarking to Cohort using Benchmark CPR Ratio

	WAC	Feb SMM3	Feb Benchmark CPR3	Benchmark CPR Ratio	Note Rate-Adjusted Benchmark CPR Ratio
FN Cohort	4.61%	2.63%	27.4%	100%	N/A
Servicer A	4.74%	4.48%	42.3%	170%	166%
Seller A	4.70%	3.43%	34.2%	130%	134%

Note: Information in Exhibit 2 is presented for illustrative purposes only. The Benchmark CPR Ratio is calculated using the Feb SMM3. It is not possible to derive the note rate-adjusted Benchmark CPR ratio from the information above.

As seen in Exhibit 2 above, we compute the ratio of the SMM3 for each seller and servicer to the SMM3 of the overall cohort — controlling for GSE — to produce a transparent indicator of prepayment speed alignment. We call this the Benchmark CPR ratio. A Benchmark CPR ratio close to 100 percent indicates that the entity's portfolio is prepaying in line with the cohort, while a Benchmark CPR ratio significantly greater than 100 percent signals that the entity's portfolio is prepaying faster than the cohort. In addition, applying a note-rate adjustment may be appropriate to better capture the distribution of note rates for the entity's portfolio. Finally, we display both the seller and servicer for each entity to properly attribute performance trends to the responsible entity. For example, for a seller that transfers most of its servicing, it may be more appropriate to focus on the speeds of the seller entity for a more representative measure of its prepayment behavior.

The resulting ratios from the Benchmark CPR calculation better enable Fannie Mae to deploy its strategy for engaging with sellers and servicers to manage prepayment speeds. We believe that early, proactive engagement with our seller and servicer partners about their prepayment behavior is the most effective way of promoting stability of prepayment performance. Addressing the root cause of prepayment deviations puts in place a long-term foundation for a productive partnership that benefits all stakeholders. Market participants should be aware of the remedies that Fannie Mae may employ when appropriate, including, but not limited to: extending premium recapture, limiting acquisition of servicing rights, adjusting buy-up/buy-down pricing, imposing delivery limits, and seller suspension.

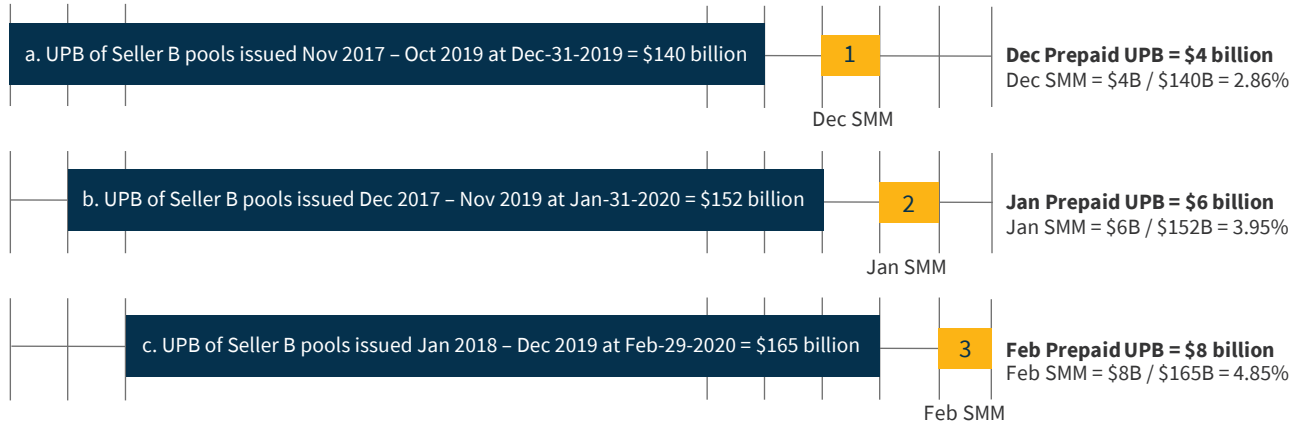
Summary

As the leading provider of liquidity to the housing finance system, Fannie Mae must balance the interests of stakeholders, including borrowers, sellers, servicers, and investors. In order to support this objective, we developed the Benchmark CPR framework, providing sellers and servicers with clear insight into how Fannie Mae is assessing their relative prepayment behavior. With the launch of the Benchmark CPR dashboard in [Data Dynamics](#), we hope to give investors transparency into the metrics that help Fannie Mae promote reliable cashflows on our securities. By its nature, the Benchmark CPR framework is flexible and may be adapted to prevailing market conditions in order for Fannie Mae to achieve this objective. Preserving the vibrancy of the TBA market is critical to maintaining the liquidity of the nation's housing finance system and lowering borrowing costs for American homeowners.

Appendix A. Requirements for Prepayment Metric

Feature	Requirement	Benchmark CPR Solution
1. Stability	A stable metric that is responsive to persistent trends rather than short-term volatility.	Weighted average of three one-month CPRs.
2. Standardized Cohorts	Reference a cohort that is defined by a fixed issuance window that rolls forward rather than by a vintage that grows over the course of the year	References a rolling issuance window rather than a vintage and/or coupon combination.
3. Recent Production	A metric that reflects the market's focus on prepayment trends for recent production.	Cohort defined by a 24-month look-back period of issuance.
4. Seasoning	A metric that is not biased by prepayment activity in the first few months after a loan is originated, which is typically muted across all sellers and servicers.	Omits the first few observations for each loan to better capture more mature prepayment behavior.
5. Servicing Transfers	A metric that recognizes the fact that the entity responsible for prepayment behavior may change due to servicing transfers.	Attributes prepayments to the owner of the servicing asset at the time of observation (applicable only to servicer view).
6. Adjustments	A metric that recognizes that sellers and servicers may employ business models that result in a borrower mix and note-rate distribution that deviates from the overall market.	Adjusts for the seller/servicer-mix across note-rate buckets.

Appendix B. Calculating the Benchmark CPR3 for Seller B



$$\text{Seller B Feb SMM3} = \frac{[\$140B \times 2.86\%] + [\$152B \times 3.95\%] + [\$165B \times 4.85\%]}{[\$140B] + [\$152B] + [\$165B]} = 3.94\%$$

$$\text{Seller B Feb Benchmark CPR3} = 1 - (1 - 3.94\%)^{12} = 38.26\%$$

Appendix C. Calculating the Benchmark CPR3 Ratio

Seller B Feb SMM3 3.94%
FN Cohort Feb SMM3 3.68%

$$\text{Seller B Feb Benchmark CPR3 Ratio} = 3.94\% \div 3.68\% = 107\%$$

Appendix D. Calculating the Note Rate-Adjusted Benchmark CPR

The table below displays the additional assumptions we will use for the purpose of illustrating the note rate adjustment calculation. **Actual note rate buckets used in Benchmark CPR3 calculation are in one-eighth percentage point increments; 50 basis point increments used here are for illustrative purposes only.** Calculations shown below will not foot due to rounding. Use the assumptions in Table 1 when performing calculations to reconcile.

Table 1. Assumptions made for Benchmark CPR Calculations

	Seller A	Cohort
Prepaid UPB by Note Rate		
3.0	Not relevant to note rate adjustment calculation	5.3
3.5		6.3
4.0		7.4
4.5		8.4
5.0		8.0
Total		35.4
Scheduled UPB by Note Rate		
3.0	57	210
3.5	105	330
4.0	58	885
4.5	30	60
5.0	0	25
Total	250	1,510

Step 1. Calculate the SMM for the cohort in each note rate bucket by dividing the cohort's actual Prepaid Balance in that note rate by the cohort's actual Scheduled UPB in that note rate.

Cohort Prepaid Balance in Feb 2020		Cohort Scheduled UPB for Feb 2020		Cohort SMM by Note Rate in Feb 2020
3.0 5.3	÷	3.0 210	=	3.0 2.52%
3.5 6.3	÷	3.5 330	=	3.5 1.91%
4.0 7.4	÷	4.0 885	=	4.0 0.84%
4.5 8.4	÷	4.5 60	=	4.5 14.00%
5.0 8.0	÷	5.0 25	=	5.0 32.00%

Step 2. Calculate Seller B's note rate weighting by dividing Seller B's scheduled UPB in that note rate by Seller B's total scheduled UPB.

Seller B Scheduled UPB Distribution by Note Rate at Feb 29, 2020		Seller B Total Scheduled UPB at Feb 29, 2020		Seller B Weight By Note Rate at Feb 29, 2020
3.0 57	÷	250	=	3.0 22.8%
3.5 105	÷		=	3.5 42.0%
4.0 58	÷		=	4.0 23.2%
4.5 30	÷		=	4.5 12.0%
5.0 0	÷		=	5.0 0.0%

Step 3. Weight the cohort SMMs in each note rate by Seller B's UPB concentration in that note rate.

Cohort SMM by Note Rate in Feb 2020		Seller B Scheduled UPB Distribution by Note Rate at Feb 29, 2020		Cohort Weighted SMM by Note Rate in Feb 2020
3.0 2.52%	X	3.0 22.8%	=	3.0 0.58%
3.5 1.91%	X	3.5 42.0%	=	3.5 0.80%
4.0 0.84%	X	4.0 23.2%	=	4.0 0.19%
4.5 14.0%	X	4.5 12.0%	=	4.5 1.68%
5.0 32.0%	X	5.0 0.0%	=	5.0 0.00%

Step 4. Sum the cohort weighted SMMs by note rate to calculate the cohort note rate-adjusted SMM.

Cohort Note Rate-Adjusted SMM in Feb 2020										
3.0 0.58%	+	3.5 0.80%	+	4.0 0.19%	+	4.5 1.68%	+	5.0 0.00%	=	Feb SMM 3.25%

Step 5. Repeat Steps 1 – 4 for Jan 2020 and Dec 2019 using Seller B’s scheduled UPB distributions and the cohort’s scheduled UPB and prepaid balances for those periods. For the sake of illustration, we assume a cohort note rate-adjusted SMM in Jan 2020 of 3.88% and a cohort note rate-adjusted SMM in Dec 2019 of 4.47%. We also assume cohort scheduled UPB (\$B) of \$1,522 for Jan 2020 and \$1,672 for Dec 2019.

Step 6. Calculate the cohort note rate-adjusted three-month average SMM.

$$\text{Cohort Note Rate-Adjusted SMM3} = \frac{(\$1,510 \times 3.25\%) + (\$1,522 \times 3.88\%) + (\$1,672 \times 4.47\%)}{\$1,510 + \$1,522 + \$1,672} = 3.89\%$$

Step 7. Convert the cohort note rate-adjusted SMM3 to Benchmark CPR3.

$$\text{Cohort Note Rate-Adjusted Benchmark CPR3} = (1 - (1 - \text{SMM3})^{12}) = 37.9\%$$

Step 8. Calculate the note rate-adjusted Benchmark CPR3 ratio.

$$\text{Feb Note Rate-Adjusted Benchmark CPR3 Ratio} = \frac{\text{Seller B SMM3}}{\text{Cohort Note Rate-Adjusted SMM3}} = \frac{3.94\%}{3.89\%} = 101\%$$

After adjusting for note rate distribution, Seller B’s Benchmark CPR ratio has dropped from 107% (as calculated in Appendix C) to 101%, signalling the Seller B’s prepayments are more in line with the cohort.

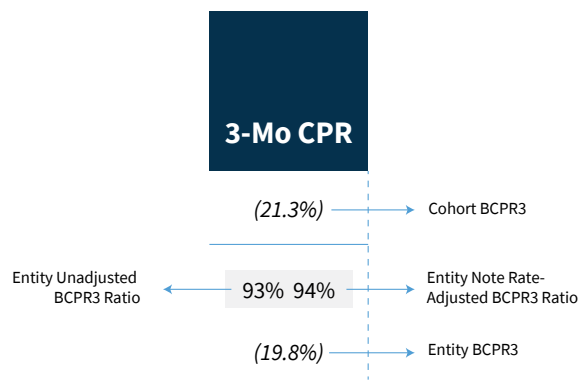
Appendix E. Interpreting the Benchmark CPR Dashboard in Data Dynamics

1. Indicates whether the seller or servicer view is being displayed.
2. Identifies whether metrics are being displayed for Fannie Mae or Freddie Mac reference populations. Line item summarizes entire cohort for that GSE.
3. The three individual components of Benchmark CPR3 calculation are shown on a standalone basis. The component CPRs are calculated from the SMM for that month.
4. The Benchmark CPR3, Benchmark CPR3 ratio, and note rate-adjusted Benchmark CPR3 ratio are shown in this column. The Benchmark CPR3 is calculated from the weighted average of the three component SMMs. The Benchmark CPR3 ratio and note rate-adjusted Benchmark CPR3 ratio are calculated from the weighted average SMM and the note rate-adjusted weighted average SMM.
5. The only relevant metric for the entire cohort is the Benchmark CPR3. The ratios are 100% since this line item represents the entire cohort.

Benchmark CPR Dashboard

1 Servicer	Orig Amount (\$ MM)	Current UPB (\$ MM)	Loan Count	Avg OLS	WAC	WALA	FICO	LTV	DTI	3 Jan CPR	Dec CPR	Nov CPR	4 3-Mo CPR
FN Cohort	2 \$845,041	\$688,608	2,909,558	\$249,511	4,469	14	744	79	37	(19.1%)	(22.0%)	(23.0%)	(21.3%)
WELLS FARGO BANK, NA	\$150,647	\$122,607	502,210	\$258,525	4,453	15	746	79	37	94% 94% (17.9%)	92% 93% (20.2%)	92% 95% (21.2%)	93% 94% (19.8%)
PENNYMAC CORP	\$72,022	\$60,058	220,852	\$282,912	4,436	11	752	81	36	99% 102% (18.9%)	98% 99% (21.5%)	102% 99% (23.4%)	99% 99% (21.2%)
QUICKEN LOANS INC	\$69,267	\$46,392	203,815	\$245,206	4,410	12	736	74	37	142% 150% (27.1%)	140% 146% (30.8%)	143% 146% (32.8%)	142% 148% (30.3%)

6. Shown in greater detail below, the metrics in the three-month CPR column represent the following:



Data Dynamics

Access the new MBS resources on Data Dynamics, Fannie Mae's free data analytics platform:
fanniemae.com/DataDynamics

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