

## **Background on the Methodology Approach in article, “Unequal Footing: Charting "Geo" Stories in Agency MBS”**

### **Overview**

We consider the largest 50 pools in each of the 50 states ( $M = 50$ ). The goal is to compute the percentage difference between each state’s CPR from the average prepayment speed. To do so we will take into account the collateral characteristics so that the average prepayment speed is calculated separately based on collateral similarity.

### **Methodology**

This analysis uses a binning approach to account for collateral characteristics of the pools while comparing state-level speeds. Specifically, it assigns the pools to  $N$  bins in each of which the pools are close in range across these characteristics.

For each bin  $i = 1, \dots, N$ , we compute the average prepayment speed as a UPB-weighted average of all  $K$  pools’ CPRs in this bin. This is also referred to as the speed of the “average pool” for the  $i$ -th bin and it is the benchmark against which the state speeds will be compared to.

$$CPR_{avg\_pool\_i} = \frac{1}{\sum_{k=1}^K UPB_k} \sum_{k=1}^K UPB_k CPR_k$$

To compute the percentage CPR difference between the speed of a state  $j$  and the overall average speed, we first need to calculate this percentage difference in the bin level. So, for the  $i$ -th bin, we compute:

$$CPR\_diff_{j,i} = 100 * \frac{1}{\sum_{k=1}^{K_j} UPB_k} \sum_{k=1}^{K_j} \left( \frac{CPR_k}{CPR_{avg\_pool\_i}} - 1 \right) * UPB_k$$

where  $UPB_k$  is the outstanding balance of pool  $k$  which is part of bin  $i$  and concentrated in state  $j$ , and  $K_j$  is the number of pools from state  $j$  in bin  $i$ .

Finally, we aggregate the above quantity across all bins, which yields the CPR difference between the speed of state  $j$  and the average CPR speed:

$$CPR\_diff_j = \frac{1}{\sum_{i=1}^N UPB_{j,i}} * \sum_{i=1}^N CPR\_diff_{j,i} * UPB_{j,i}$$

where  $UPB_{j,i}$  is the outstanding balance of state  $j$  pools in bin  $i$ .