

The Mathematical Representation of the CME CF BRR Methodology is represented below:

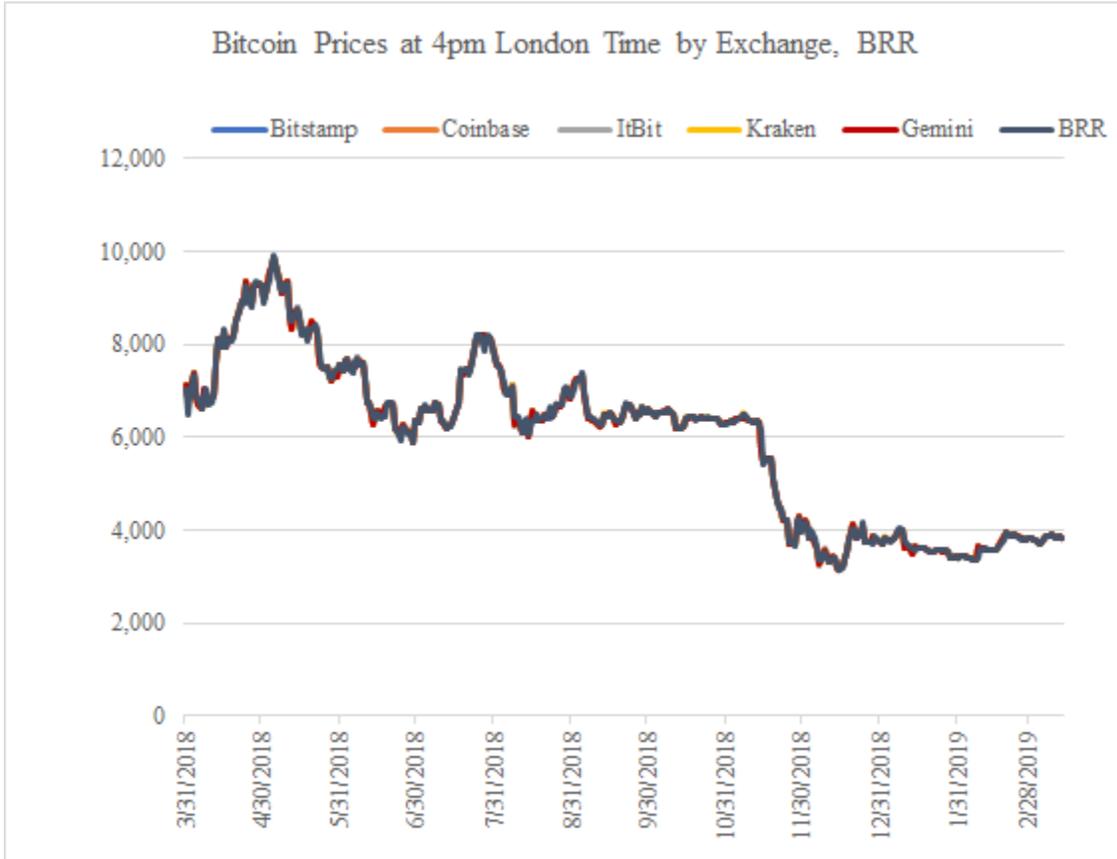
Symbol	Name	Description
T	Effective Time	Time at which the BRR is calculated
T	TWAP Period Length	Length of the Time Weighted Average Price (TWAP) period for which trade data is observed (60 minutes)
$\hat{T}$	Partition Length	Length of each partition (5 minutes)
$x_i$	Partition Trade	$i^{\text{th}}$ price/size trade pair in partition
$P_i$	Partition Trade Price	$i^{\text{th}}$ trade price in partition
$s_i$	Partition Trade Size	$i^{\text{th}}$ trade size in partition
K	Number of Partitions	number of partitions – given by $T/\hat{T}$
k	Partition Number	$k^{\text{th}}$ partition
$WM_k$	Weighted Median	Size-weighted median for the $k^{\text{th}}$ partition
$BRR_T$	Bitcoin Reference Rate	BRR at time T

Figure 1: Calculation used to determine the CME CF BRR

$$\begin{aligned}
 WM_k = p_j \text{ where } x_j \text{ satisfies } \sum_{i=1}^{j-1} s_i < \frac{\sum_{i=1}^{I_k} s_i}{2} \text{ and } \sum_{i=j+1}^{I_k} s_i \leq \frac{\sum_{i=1}^{I_k} s_i}{2} \\
 \text{If } \sum_{i=j+1}^{I_k} s_i = \frac{\sum_{i=1}^{I_k} s_i}{2} \text{ then } WM_k = \frac{p_j + p_{j+1}}{2} \tag{1} \\
 BRR_T = \frac{\sum_{k=1}^K WM_k}{K}
 \end{aligned}$$

$WM_k$  is thus calculated as the price ( $P_j$ ) of the  $j^{\text{th}}$  trade where the  $j^{\text{th}}$  trade is the trade that lies at 50% of the cumulative size for the partition k.  $WM_k$  is calculated for each partition in T and the BRR is found to be the mean  $WM_k$  of all the K partitions.

Figure 2<sup>1</sup>



<sup>1</sup> Analysis performed by the Sponsor using data provided by Kaiko//Challenger Deep.