

The Median Absolute Deviation about the Median (MAD)

A measure of spread that has a long tradition is the *Median Absolute Deviation about the Median* (*MAD*), also sometimes (humorously) abbreviated the *MADAM*. The MAD is defined as follows for a data set $\{X_1, \dots, X_n\}$:

1. Compute the *median*,

$$\text{Med}_n = \text{median of } \{X_1, \dots, X_n\}.$$

2. Next compute the absolute deviations about the median,

$$\{|X_1 - \text{Med}_n|, \dots, |X_n - \text{Med}_n|\}.$$

3. Finally, get the median of these absolute deviations,

$$\text{MAD}_n = \text{median of } \{|X_1 - \text{Med}_n|, \dots, |X_n - \text{Med}_n|\}.$$

One appeal of the MAD is its simplicity. Another is its high *robustness* – like the median, the MAD is unaffected even if 50% of the data are moved to $+\infty$ (or all to $-\infty$). In comparison, the interquartile range (IQR) allows only up to 25% of the observations to be taken to $\pm\infty$ without “breaking down”. And the standard deviation, like the mean, breaks down if just one observation is taken to $\pm\infty$.