X-Bar and R Charts for Skewed Populations

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This paper proposes a heuristic method based on a weighted variance (WV) concept in setting up the control limits of X-Bar and R control charts for skewed populations. This method provides asymmetric control limits in accordance with the direction and degree of skewness estimated from the sample data by using different variances in computing the upper and lower control limits. For symmetric populations, however, these control limits are equivalent to those of Shewhart control charts. The new control charts are compared with Shewhart control chart by a Monte Carlo simulation when the underlying populations are normal and Weibull, and are found to provide better performances than Shewhart control charts as skewness increases.