**Project: Standard Deviation, Range Rule of Thumb, and Percentage Error Assignment Instructions**

Overview

**Standard deviation** is a reliable (and commonly used) measure of variation. Standard deviation essentially describes the average distance that each data value is away from the mean. Computing standard deviation by hand can be complicated so you are asked to use Excel to calculate it for this project. You will also calculate the **Range Rule of Thumb (RROT)**. The RROT is based on the insight that the range is often approximately four times as large as the standard deviation. This insight enables you to quickly estimate the standard deviation of a data set quickly. Lastly, you will calculate the percentage error of each data set. **Percent error** is the difference between estimated value (RROT) and the actual value (standard deviation) in comparison to the actual value and is expressed as a **percentage**.

Instructions

This assignment will be completed in two parts: Data Sets and Summary. After completing the computations for the Data Sets, you will summarize what you have learned by answering the questions after the data sets. See both sections below to find more information.

**Data Sets**

Each of the following 5 data sets has a mean close to 100, and a standard deviation in the 20s. Assume that each of these are sample data sets. Excel can be used to do the calculations. For each of the 5 data sets given below to find the following:

* Sample Standard Deviation: use the Excel function “=stdev.s” (or technology)
* Range Rule of Thumb (RROT) Estimate: the formula for the RROT estimate is RROT estimate = Range/4 (where the range = maximum value – minimum value), on the assumption that the Standard Deviation ≈ RROT estimate.
* Percentage Error (% Error): The formula used to find the percentage error of the estimate is:

% Error = **|** RROT Estimate – Standard deviation **|** / Standard Deviation × 100 = \_\_\_\_ % .

1. **Data Set 1: No outliers**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 90 | 90 | 90 | 90 | 130 | 130 | 130 | 130 | 130 |

Actual Standard deviation = RROT Estimate = % Error =

1. **Data Set 2: 1 outlier**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | 81 | 81 | 81 | 81 | 82 | 82 | 82 | 82 | 160 |

Actual Standard deviation = RROT Estimate = % Error =

1. **Data Set 3: 2 outliers**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 38 | 86 | 88 | 89 | 90 | 90 | 91 | 92 | 104 | 152 |

Actual Standard deviation = RROT Estimate = % Error =

1. **Data Set 4:** **Normal (Bell-Shaped) Distribution**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 51 | 67 | 74 | 81 | 87 | 93 | 99 | 106 | 115 | 128 |

Actual Standard deviation = RROT Estimate = % Error =

1. **Data Set 5: Uniform Distribution (evenly-spaced values)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 65 | 73 | 81 | 89 | 97 | 105 | 113 | 121 | 129 | 137 |

Actual Standard deviation = RROT Estimate = % Error =

**Summary**

Summarize what you learned:

a) Does the Range Rule of Thumb estimate more often underestimate or overestimate the actual standard deviation?

b) What is the largest percentage error?

c) Each of the data sets given above is artificially contrived. If you were to apply the RROT estimate to a typical real-world data set, about how accurate would you expect it to be (your answer here should be a numerical estimate of the percentage error, based on your previous results)?

Note: Your assignment will be checked for originality via the Turnitin plagiarism.