

### Sen's Slope Estimate (Series Data)

The BoltSize.LAZ file is used to illustrate this procedure. The purpose is to estimate the slope from one time period to another time period for a series of data over equal intervals of time. The optional plot provides a graphical representation of the slopes obtained. One can often visually spot non-random patterns in the data and cyclic trends.

Sen's Nonparametric Estimation of Slope

Sen's method for the detection and estimation of trends is used to analyze one or more variable observations collected at equally spaced intervals of time. First, select one or more series variables to analyze. Next, if you have entered more than one variable, indicate how the measures are to be combined (mean or median) and if the values are to be standardized (z scores with mean of 0 and standard deviation of 1.) Finally, select the options desired and click the OK button to complete the analysis.

If more than one variable:

- ☐ Standardize the measures
- ☐ Calculate Average Slope

Plot:

- ☒ Each Variable
- ☐ Ranked Slopes

Print:

- ☐ Data
- ☐ Slopes Matrix
- ☐ Ranked Slopes

Alpha Level: 0.05

Available Variables

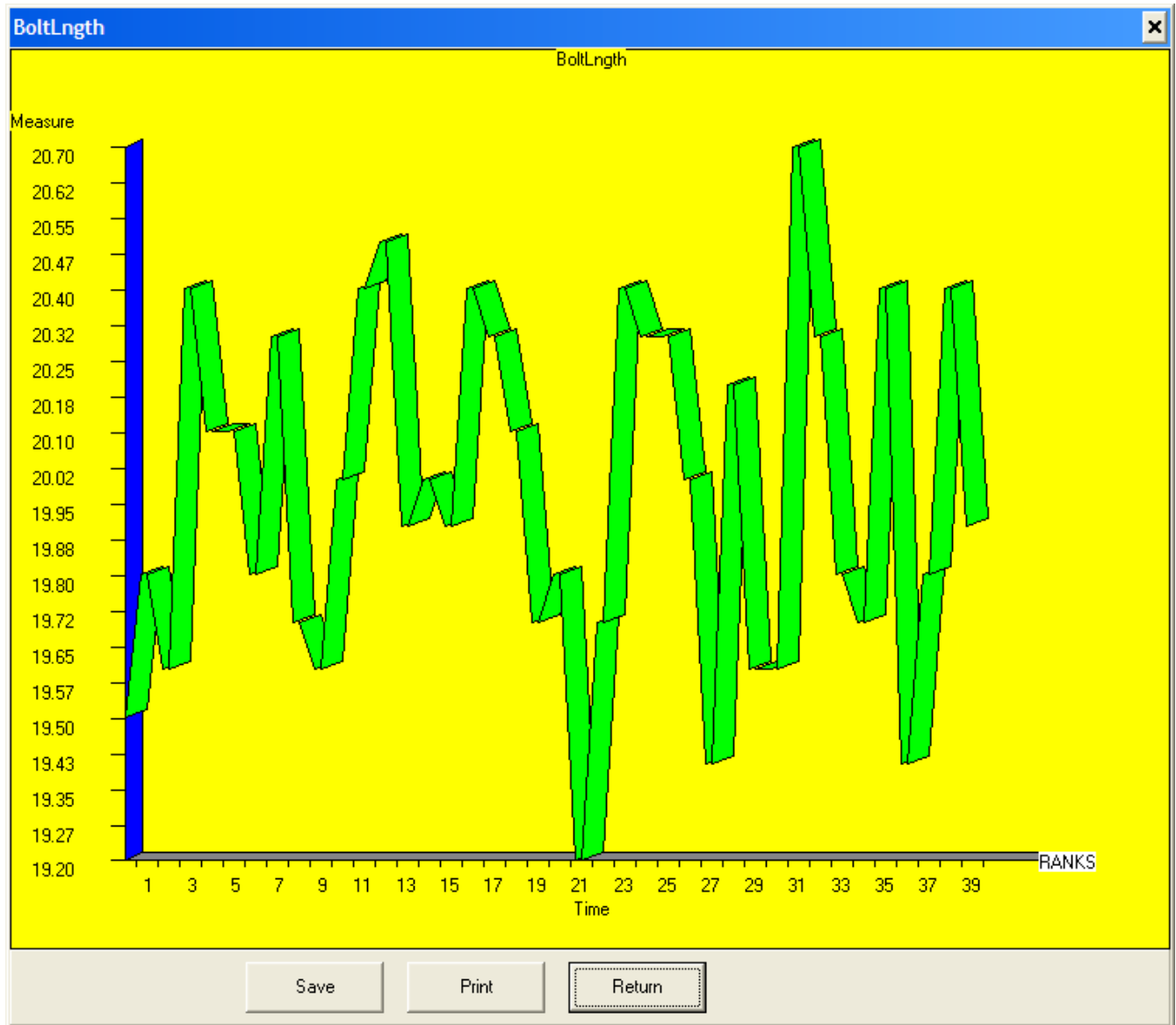
- LotNo

Variables to Analyze

- BoltLength

Reset Cancel OK

Figure 1. Sen's Slope Estimates for Series Data



**Figure 2. Plot of Slopes From Sen's Slope Estimates**

SEN'S DETECTION AND ESTIMATION OF TRENDS

Number of data points = 40, Confidence Interval = 0.97

Results for BoltLngth

Median Slope for 780 values = 0.000

Mann-Kendall Variance statistic = 7275.667 (9 ties observed)

Ranks of the lower and upper confidence = ( 306.410, 474.590)

Corresponding lower and upper slopes = ( -0.010, 0.011)