Calculating Power

Data Science for Quality Management: Two Sample Hypothesis Testing

with **Wendy Martin**

Learning objective:

Calculate Power for changes in means and variance for a non-directional test

Example 1

- The Product Design and Marketing Departments have agreed to consider changing the material for the handle of a trenching shovel

Example 1

- The material presently used is hickory wood
- A potential supplier has offered a handle of the same design but made of a composite material, at a significantly lower price

Example 1

- One of the critical product characteristics for the handle is handle strength
- The method of measuring this characteristic is destructive in nature

Example 1

- You have been given the following process values for the existing material:
  - μ = 440 lbs, σ = 10 lbs
  - γ_3 = 0.0, and γ_4 = 0.0 (Normally distributed)

Example 1

- A sample of the composite material handle is to be tested

- The following values are assumed to be appropriate for the test: $\Delta\mu$ = 10 lbs, n = 9, and level of confidence = 95%.

Example 1

- Under these conditions, what are β and power (assuming no change has occurred in the dispersion or variability of the process)?

Beta and Power for Changes in Means

- In Rstudio

```
> power.mean.t.onesample
```

Example 2

- Using the same data, let's now suppose that the following values are assumed to be appropriate for the test: $\Delta\sigma$ = 2 lbs, n = 9, and level of confidence = 95%.

Beta and Power for Changes in Variance

- In Rstudio

```
> power.variance.onesample
```

Sources

- Luftig, J. An Introduction to Statistical Process Control & Capability. Luftig & Associates, Inc. Farmington Hills, MI, 1982