ASQ CRE Prep course

Lesson II. A. 5. b.

Non-Parametric Methods

Ranking

Powerful nonparametric techniques

NONPARAMETRIC TECHNIQUES

Kendall Coefficient of Concordance

- **Let's say three people ranked ordered their preference for 10 pieces of music.**

- **Determine if the three people like the same music (similar rank orders)**

Rankings (raw data)

A	B	C
1	7	6
5	6	4
6	2	8
7	5	5
10	9	10
4	3	1
8	1	3
3	10	9
9	4	7
2	8	2

Rank Sums(add across)

A	B	C
1	7	6
5	6	4
6	2	8
7	5	5
10	9	10
4	3	1
8	1	3
3	10	9
9	4	7
2	8	2

i	R_i
1	14
2	15
3	16
4	17
5	29
6	8
7	12
8	22
9	20
10	12

Some calculations

- **Determine R-bar**

$$\overline{R} = m(n+1)/2$$

- **m is number of evaluators**
- **n is number of items being ranked**
- **In this case R-bar is 16.5**

- **Compute S – sum of squared deviations**

$$S = \sum_{i=1}^{n} \left(R_i - \overline{R} \right)^2$$

- **S = 320.5**

W Coefficient

- **Compute Kendall's coefficient of concordance, W**

$$W = \frac{12S}{m^2\left(n^3 - n\right)}$$

W is between zero (no concordance) and 1 (high concordance)

- **W = 0.432**

Test Statistic

- **Chi Squared value** **This is only for n > 7**

$$W = \frac{12S}{mn(n+1)}$$

- $X^2 \approx 11.65$

Critical Value

- For n > 7 use Chi-squared
- df = n – 1
- Alpha = 0.1 (using 90% confidence)

- From tables
- 14.684
- Since the test statistic is less then critical value, 11.65. Insufficient evidence of alignment between rankings.

Spearman Rank Correlation Coefficient

- **Determine degree of association between two ordered series.**
- **Like ratings on movies**
- **Unknown distribution**
- **R_s approaches 1 or -1 for strong correlation and approaches 0 for weak correlation.**

$$r_s = 1 - \left(\frac{6 \sum D^2}{n\left(n^2 - 1\right)} \right)$$

Kruskal-Wallis One-way Analysis of Variance by Ranks

- Compare 3 or more groups or treatments
- Any or unknown distribution
- Data has to be suitable for ranking
- Comparing ranking, not actual data
- Hypothesis test structure
- Ranks in each group about the same – null

See

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Non-Parametric Methods

Reliability & Comparisons