Column Diagnostics & Non-parametric statistics

- New tool for reviewing data
- Statistical tests for assumptions of AOV, run on residuals
- ARM recommends actions from results
- View diagnostic plots of data and residuals
- Find outliers

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2019.8

Diagnostics

				Sho	ow Graphs (R	aw)
Statistics (P)	Raw 🖂		AL 🗌	AS 🗌		AR 🗌
Ν	19	19	19	19	19	19
Unique	17	19	19	19	19	18
Missing	1	1	1	1	1	1
Treatments	5	5	5	5	5	5
Levene's	0.343	0.0	0.0	0.0	0.0	
ShapiroWilks	0.929	1.0	0.999	0.998	0.999	
Skewness	0.614	0.958	0.9	0.932	0.933	
Kurtosis	0.661	0.847	0.901	0.878	0.877	

Statistical tests for assumptions of AOV analysis

- Levene's: homogeneity of variance
- Shapiro-Wilk's: general test for normality
- Skewness/Kurtosis: tests for normality

Tests performed on **residuals**, not raw data Significant P value -> test fails, so assumption is <u>not</u> met

Recommends actions for failed tests of AOV assumptions

- Transformations
- Non-parametric analysis

Re	Recommendations										
Ba	sis	Rating Unit : Pl	LANT	~							
				Show Graphs (AS)							
	Code	Test Statistic	Comment								
1	AS	Levene's	3.026	Transform to stabilize variance							
2	AR	ShapiroWilks	0.873	Available transformations do not improve normality							
3	IID	Skewness	Skewness 0.143 Does not fail test of skewness of residuals								
4	AR	Kurtosis	7.126	Available transformations do not correct kurtosis of residuals							

Basis

Suggestions based on assumed distribution of data

• Determined from: Rating Type, Rating Unit, range of data values

Rating Unit : PLANT Assessment Values No 'ARM Action Codes' specified Rating Type : STAOBJ Rating Unit : PLANT

Diagnostics

Statistics (P)	Raw 🗹	IID 🗌
Ν	19	19
Unique	17	19
Missing	1	1
Treatments	5	5
Levene's	0.343	0.0
Shapiro Wilks	0.929	1.0
Skewness	0.614	0.958
Kurtosis	0.661	0.847

IID - new ARM Action Code

- Identically and Independently Distributed
- Signifies that column meets all assumptions of AOV

A way to mark column as reviewed, but without any corrections required

AOV analysis is then run on the **residuals** (previously were run on raw data)

View diagnostic plots:

- Data vs. residuals
- AOV residuals vs. transformed residuals



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Search for outliers

- Search for outliers based on residuals
- Calculates a studentized residual (accounts for number of observations)
- *(coming soon)* Exclude all calculated outliers in the column

Re	Recommendations										
	Actio	nCode	Cr	iteria		Value		Comment			
1	EX		Out	liers	NA			Exclude	outliers to reduce skewness		
Ou	tliers										
	plot treatment replicate column assessment31 StdRes										
1	102		9		1	2		1	-4.5		

Non-parametric statistics

- Relies on ranks to analyze data, instead of means and st. dev.
- New ARM Action Code: **AR** (automatic rank transformation)
 - Rank the data points (Kruskal-Wallis or Friedman's test)
 - Perform mean comparison test on rank means (LSD)
- Analysis included with other AOV columns

Pest N Pest N Rating Rating Rating	Type Name Date Type Unit		V Se	V Weed Oxeye p-4-2016 STAOBJ PLANT	W Weed Oxeye Sep-4-2016 STAOBJ PLANT		
ARM	Action Code:	npies s		1		AR	
Trt No.	Treatmer Name	nt Appl Code		34	35		
	1 Bum	А	0.0)c	3.8 b		
	2 Bum	А	0.1	1 c	4.7 b		
	3 Bum A 4 Mow A		0.0) c	4.5 b 3.8 b		
			0.0)c			
	5 Mow	А	0.0)c	3.8 b		
	6 Mow	А	0.0)c	3.8 b		
	7 Spray	А	0.0) c	3.8 b		
	8 Spray	А	1.3	7 a	8.9 a		
	9 Spray	А	0.8	3 b	7.9 a		
LSD P Leven Leven Friedn P(Frie Ske w Kurto:	P=.05 le's F le's Prob(F) n an's X2 dm an's X2) ne ss sis			1.66 2.794 0.016* 2.1418* 3.6057*	0 3 0 4	1.13 2.40 .035* 4.526 0.00 .4492 .7736	

Reported values for columns 35 are rank means and not assessment means

Why non-parametric???

- ANOVA has assumptions that must be met
 - Otherwise results may not be valid
- Non-parametric analysis does not have these restrictions
- Use non-parametric when:
 - Data cannot be corrected to fit assumptions of AOV
 - Data is not real-valued, like counts or index scales