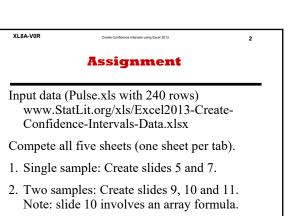
#### XL8A-VOR Over Confidence Intervals Create Confidence Intervals Using Excel 2013

#### **Milo Schield**

Member: International Statistical Institute US Rep: International Statistical Literacy Project Director, W. M. Keck Statistical Literacy Project

Slides, Output and Data at www.StatLit.org/ pdf/Excel2013-Create-Confidence-Intervals-Slides.pdf pdf/Excel2013-Create-Confidence-Intervals-Results.pdf xls/Excel2013-Create-Confidence-Intervals-Data.xlsx



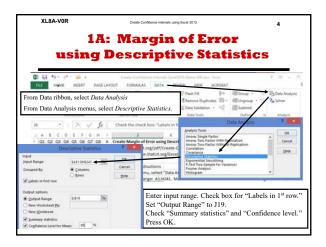
3. Upload completed spreadsheet.

#### XLBA-VOR Count Confidence Marries using East 2013 1. Using Excel to Build One-group Margin of Error

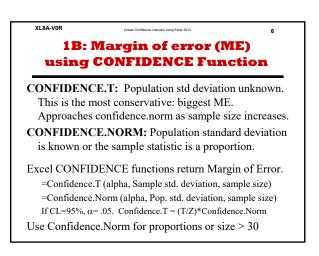
3

For single-sample (1-group) confidence intervals

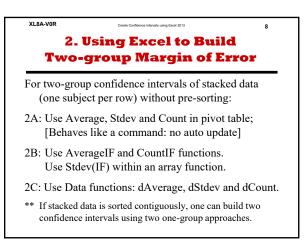
- 1A: Use Excel Toolpak Descriptive-Statistics. Excel describes the Margin of Error as the Confidence Level (95%). [Behaves like a command: no auto-update]
- 1B: Use functions: CONFIDENCE (or STDEV and COUNT) and AVERAGE. Recommended since it auto-updates.



	1A: 1	Ma	ra	in	of	Er	roi		
			_						
1	using De	esc	;ri	ptĭ	ve	Sta	ati	stie	CS
Row	1	к	L	М	N	0	р	Q	R
18									
19		Q1	Q2	QJ	Q4	Q5	Q6	Q7	Q8
20									
	Mean	0.46	0.28	0.59	0.37	3.48	2.59	65.40	5.51
	Standard Error	0.03	0.03	0.03	0.03	0.08	0.09	0.76	0.08
	Median	0	0	1	0	4	2	65	6
	Mode	0	0	1	0	3	2	76	6
	Standard Deviation	0.50	0.45	0.49	0.48	1.21	1.42	11.79	1.16
	Sample Variance	0.25	0.20	0.24	0.23	1.46	2.03	139.08	1.36
	Kurtosis	-1.99	-1.03	-1.87	-1.70	-0.33	-1.22	0.39	0.21
	Skewness	0.17	0.99	-0.38	0.56	-0.57	0.43	0.34	0.15
	Range	1	1	1	1	4	4	66	6
	Minimum	0	0	0	0	1	1	34	3
	Maximum	1	1	1	1	5	5	100	9
	Sum	110	67	142	88	835	622	15697	1323
	Count	240	240	240	240	240	240	240	240
-	Confidence Level(95%)	0.06	0.06	0.06	0.06	0.15	0.18	1.50	0.15

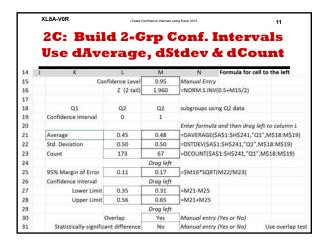


	-	_	-							idence.T
Row	L L	к	L	М	Ν	0	Ρ	Q	R	Formula in col S is for col R
12								Alpha	0.05	Manual Entry
13							Samp	le size	240	=COUNTA(A2:A241)
14										
15	Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Question
16	Average	0.46	0.28	0.59	0.37	3.48	2.59	65.4	5.51	=AVERAGE(H2:H241)
17	StDev Sample	0.50	0.45	0.49	0.48	1.21	1.42	11.79	1.16	=STDEV.S(H2:H241)
18	Stdev.S and conf	idenc	e.T is r	nost c	onserv	/ative				Enter dollar signs (\$) as shown
19	Margin Error	0.06	0.06	0.06	0.06	0.15	0.18	1.50	0.15	=CONFIDENCE.T(\$R12,R17,\$R13
20	CnfInt: Up-Right	0.52	0.34	0.65	0.43	3.63	2.77	66.90	5.66	=R16+R19
21	CnfInt:Low-Left	0.39	0.22	0.53	0.31	3.33	2.41	63.90	5.36	=R16-R19



	XL	.8A-V0R		2013 9		
	2					nf. Intervals Statistics
Row	J	K	L	м	N	Formula for cell to the left
17	1	Go to Step 2	Confid	dence Level	0.95	Manual entry
18	**		** ** **	•• •• ••	** ** *	* ** ** ** ** **
19			Q1 if Q2=0	Q1 if Q2=1	Q1	
20	6	Margin of Error	7%	12%	6%	=CONFIDENCE.NORM(1-\$N17,N32,N33)
21		/				Use Confidence.T if data is quantitative
22		Difference in sar	nple propor	tions.	3%	=ABS(M31-L31)
23		CI-Upper-Right	53%	60%	52%	=N31+N20
24		CI Lower-Left	38%	36%	40%	=N31-N20
25		Note: Formulas i	n columns L	and M are d	letermined	by those in column N
26	7	Confidence In	tervals over	lap/touch?	YES	Manual entry
27		Is difference s	tatistically s	ignificant?	NO	Manual entry. Use overlap test
28	**	** ** ** **	** ** **	•• •• ••	** ** *	* ** ** ** **
29	2		Column 💌	oels		
30		Values	0	1	Grand Tot	al
31	3	Average of Q1	0.45	0.48	0.46	
32	4	StdDev of Q1_2	0.50	0.50	0.50	
33	5	Count of Q1_3	173	67	240	

	XL8	BA-VOR	Create Confide	nce Intervals using Exc	10		
		B: Build		-			
	S	e Averag	eIf, C			•	<u> </u>
14	1	ĸ	L	M	N	Formula for cell	to the left
15	1	Confidence Level	0.95	Z (2 tail)	1.960	=NORM.S.INV(0.	5+L15/2)
16							
17		L18: Change 1 to 0	Q2=0	Q2=1	Drag M18 to	L18. Change =1 to	o =0
18	2	Q1 average	45%	48%	=AVERAGEIF(	\$B2:\$B241,"=1",\$	A2:\$A241)
19				Pull left			
20		L21: Change 1 to 0			Do not ente	r braces shown be	lowl
21	3	Q1 Stdev	50%	50%	{=STDEV(IF(\$	82:\$8241=1,\$A2:\$	A241))}
22				Pull left	Use CTRL-SI	HIFT-ENTER to crea	ate braces!
23		L24: Change 1 to 0					
24	4	Q1 sample size	173	67	=COUNTIF(\$B	2:\$B241,"=1")	Pull left
25	5	Q1 Margin of Error	7%	12%	=\$N15*M21/	SQRT(M24)	Pull left
26		1		Pull left			
27	6	Q1 Cnf Int Up-Right	53%	60%	=M18+M25		Pull left
28		Q1 Cnf Int Low-Left	38%	36%	=M18-M25		Pull left
29	7	Overla	ap or touch?	YES			
30		Is difference stat.	significant?	NO	Use overlap	test	
31		Change =1 to =0 in L18.	121 and 124.				





If two 95% confidence intervals do not overlap, then the difference in means is statistically-significant. But the converse may be false: those cases that overlap may still have differences that are statistically significant. If the 95% confidence interval for one group does not overlap **the mean for the second**, then the difference in means is statistically-significant – at the 0.05 level. In this case, the converse is also true: those cases where the confidence interval overlaps the mean are not statistically significant. See Conrad Carlberg's article:

www.quepublishing.com/articles/article.aspx?p=1717265&seqNum=3

# Create Confidence Intervals Using Excel 2013

### **Milo Schield**

Member: International Statistical Institute US Rep: International Statistical Literacy Project Director, W. M. Keck Statistical Literacy Project

Slides, Output and Data at www.StatLit.org/ pdf/Excel2013-Create-Confidence-Intervals-Slides.pdf pdf/Excel2013-Create-Confidence-Intervals-Results.pdf xls/Excel2013-Create-Confidence-Intervals-Data.xlsx



Input data (Pulse.xls with 240 rows) www.StatLit.org/xls/Excel2013-Create-Confidence-Intervals-Data.xlsx

Compete all five sheets (one sheet per tab).

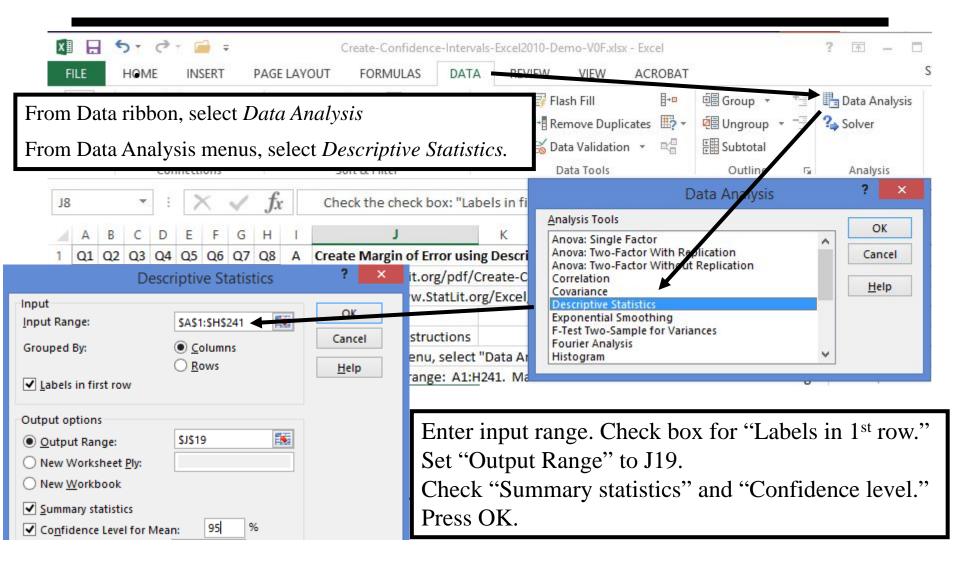
- 1. Single sample: Create slides 5 and 7.
- 2. Two samples: Create slides 9, 10 and 11. Note: slide 10 involves an array formula.
- 3. Upload completed spreadsheet.

#### 1. Using Excel to Build One-group Margin of Error

For single-sample (1-group) confidence intervals

- 1A: Use Excel Toolpak Descriptive-Statistics.Excel describes the Margin of Error as the Confidence Level (95%).[Behaves like a command: no auto-update]
- 1B: Use functions: CONFIDENCE (or STDEV and COUNT) and AVERAGE.Recommended since it auto-updates.

# 1A: Margin of Error using Descriptive Statistics



### 1A: Margin of Error using Descriptive Statistics

Row	J	К	L	М	Ν	0	Ρ	Q	R
18									
19		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
20									
	Mean	0.46	0.28	0.59	0.37	3.48	2.59	65.40	5.51
	Standard Error	0.03	0.03	0.03	0.03	0.08	0.09	0.76	0.08
	Median	0	0	1	0	4	2	65	6
	Mode	0	0	1	0	3	2	76	6
	Standard Deviation	0.50	0.45	0.49	0.48	1.21	1.42	11.79	1.16
	Sample Variance	0.25	0.20	0.24	0.23	1.46	2.03	139.08	1.36
	Kurtosis	-1.99	-1.03	-1.87	-1.70	-0.33	-1.22	0.39	0.21
	Skewness	0.17	0.99	-0.38	0.56	-0.57	0.43	0.34	0.15
	Range	1	1	1	1	4	4	66	6
	Minimum	0	0	0	0	1	1	34	3
	Maximum	1	1	1	1	5	5	100	9
	Sum	110	67	142	88	835	622	15697	1323
	Count	240	240	240	240	240	240	240	240
X	Confidence Level(95%)	0.06	0.06	0.06	0.06	0.15	0.18	1.50	0.15

**Confidence Level:** Margin of Error =T\*StdDev()/Sqrt(n)

### **1B: Margin of error (ME) using CONFIDENCE Function**

- CONFIDENCE.T: Population std deviation unknown. This is the most conservative: biggest ME. Approaches confidence.norm as sample size increases.
  CONFIDENCE.NORM: Population standard deviation is known or the sample statistic is a proportion.
- Excel CONFIDENCE functions return Margin of Error. =Confidence.T (alpha, Sample std. deviation, sample size) =Confidence.Norm (alpha, Pop. std. deviation, sample size) If CL=95%,  $\alpha$ = .05. Confidence.T = (T/Z)\*Confidence.Norm Use Confidence.Norm for proportions or size > 30

# 1B: Confidence Intervals using Stdev.S and Confidence.T

Row	J	К	L	М	Ν	0	Ρ	Q	R	Formula ir	n co <mark>l</mark> S is fo	r col R
12								Alpha	0.05	Manual En	try	
13							Sampl	e size	240	=COUNTA	(A2:A241)	
14												
15	Question	<b>Q1</b>	Q2	Q3	Q4	Q5	<b>Q6</b>	Q7	Q8	Question		
16	Average	0.46	0.28	0.59	0.37	3.48	2.59	65.4	5.51	=AVERAGE	E(H2:H241)	
17	StDev Sample	0.50	0.45	0.49	0.48	1.21	1.42	11.79	1.16	=STDEV.S(	H2:H241)	
18	Stdev.S and cont	fidenc	e.T is i	nost o	onserv	vative				Enter dollar	r signs (\$) a:	s shown
19	Margin Error	0.06	0.06	0.06	0.06	0.15	0.18	1.50	0.15	=CONFIDEN	CE.T(\$R12,R	17,\$R13)
20	CnfInt: Up-Right	0.52	0.34	0.65	0.43	3.63	2.77	66.90	5.66	=R16+R19		
21	CnfInt:Low-Left	0.39	0.22	0.53	0.31	3.33	2.41	63.90	5.36	=R16-R19		

Average gives proportion if binary data is coded 0 or 1

### 2. Using Excel to Build Two-group Margin of Error

- For two-group confidence intervals of stacked data (one subject per row) without pre-sorting:
- 2A: Use Average, Stdev and Count in pivot table; [Behaves like a command: no auto update]
- 2B: Use AverageIF and CountIF functions. Use Stdev(IF) within an array function.
- 2C: Use Data functions: dAverage, dStdev and dCount.
- \*\* If stacked data is sorted contiguously, one can build two confidence intervals using two one-group approaches.

# 2A: Build 2-Grp Conf. Intervals using Pivot Table Statistics

Row	J	K	L	М	Ν	Formula for cell to the left			
17	1	Go to Step 2	Confid	lence Level	0.95	Manual entry			
18	**	** ** ** ** *	** ** **	** ** **	** ** **	* ** ** ** ** **			
19			Q1 if Q2=0	Q1 if Q2=1	Q1				
20	6	Margin of Error	7%	12%	6%	=CONFIDENCE.NORM(1-\$N17,N32,N33)			
21						Use Confidence.T if data is quantitative			
22		Difference in san	nple proport	ions.	3%	=ABS(M31-L31)			
23		CI-Upper-Right	53%	60%	52%	=N31+N20			
24		CI Lower-Left	38%	36%	40%	=N31-N20			
25		Note: Formulas i	n columns L	and M are d	determined by those in column N				
26	7	Confidence Int	tervals overl	ap/touch?	YES	Manual entry			
27		Is difference s	tatistically si	ignificant?	NO	Manual entry. Use overlap test			
28	**	** ** ** ** *	** ** **	** ** **	** ** **	* ** ** ** **			
29	2		Column 💌	els					
30		Values	0	1	Grand Tota				
31	3	Average of Q1	0.45	0.48	0.46				
32	4	StdDev of Q1_2	0.50	0.50	0.50				
33	5	Count of Q1_3	173	67	240				

# 2B: Build 2-Grp Conf. Intervals. Use AverageIf, CountIf & {Stdev(If)}

14	J	К	L	М	Ν	Formula for cell	to the left	
15	1	Confidence Level	0.95	Z (2 tail)	1.960	=NORM.S.INV(0.	5+L15/2)	
16								
17		L18: Change 1 to 0	Q2=0	Q2=1	Drag M18 to L18. Change =1 to =0			
18	2	Q1 average	45%	48%	=AVERAGEIF(\$B2:\$B241,"=1",\$A2:\$A24			
19				Pull left				
20		L21: Change 1 to 0			Do not enter braces shown below!			
21	3	Q1 Stdev	50%	50%	{=STDEV(IF(\$B2:\$B241=1,\$A2:\$A241))}			
22				Pull left	Use CTRL-SHIFT-ENTER to create braces			
23		L24: Change 1 to 0						
24	4	Q1 sample size	173	67	=COUNTIF(\$B2	2:\$B241,"=1")	Pull left	
25	5	Q1 Margin of Error	7%	12%	=\$N15*M21/S	SQRT(M24)	Pull left	
26				Pull left				
27	6	Q1 Cnf Int Up-Right	53%	60%	=M18+M25		Pull left	
28		Q1 Cnf Int Low-Left	38%	36%	=M18-M25		Pull left	
29	7	Ove	rlap or touch?	YES				
30		Is difference sta	at. significant?	NO	Use overlap t	est		
31		Change =1 to =0 in L18	8, L21 and L24.					

# 2C: Build 2-Grp Conf. Intervals Use dAverage, dStdev & dCount

14	J	К	L	М	N	Formula for cell to the left			
15		Со	nfidence Level	0.95	Manual Entry				
16			Z (2 tail)	1.960	=NORM.S.INV(	0.5+M15/2)			
17									
18		Q1	Q2	Q2	subgroups using Q2 data				
19		Confidence Interval	0	1					
20					Enter formula and then drag left to column L				
21		Average	0.45	0.48	=DAVERAGE(\$A\$1:\$H\$241,"Q1",M\$18:M\$19)				
22		Std. Deviation	0.50	0.50	=DSTDEV(\$A\$1:\$H\$241,"Q1",M\$18:M\$19)				
23		Count	173	67	=DCOUNT(\$A\$1:\$H\$241,"Q1",M\$18:M\$19)				
24				Drag left					
25		95% Margin of Error	0.11	0.17	=\$M16*SQRT(	M22/M23)			
26		Confidence Interval		Drag left					
27		Lower Limit	0.35	0.31	=M21-M25				
28		Upper Limit	0.56	0.65	=M21+M25				
29				Drag left					
30			Overlap	Yes	Manual entry	(Yes or No)			
31		Statistically-signific	ant difference	No	Manual entry	(Yes or No) Use overlap test			

#### Statistical Significance and Confidence Intervals

If two 95% confidence intervals do not overlap, then the difference in means is statistically-significant. But the converse may be false: those cases that overlap may still have differences that are statistically significant. If the 95% confidence interval for one group does not overlap **the mean for the second**, then the difference in means is statistically-significant – at the 0.05 level. In this case, the converse is also true: those cases where the confidence interval overlaps the mean are not statistically significant. See Conrad Carlberg's article: www.quepublishing.com/articles/article.aspx?p=1717265&seqNum=3