Introductory Econometrics

Using Excel

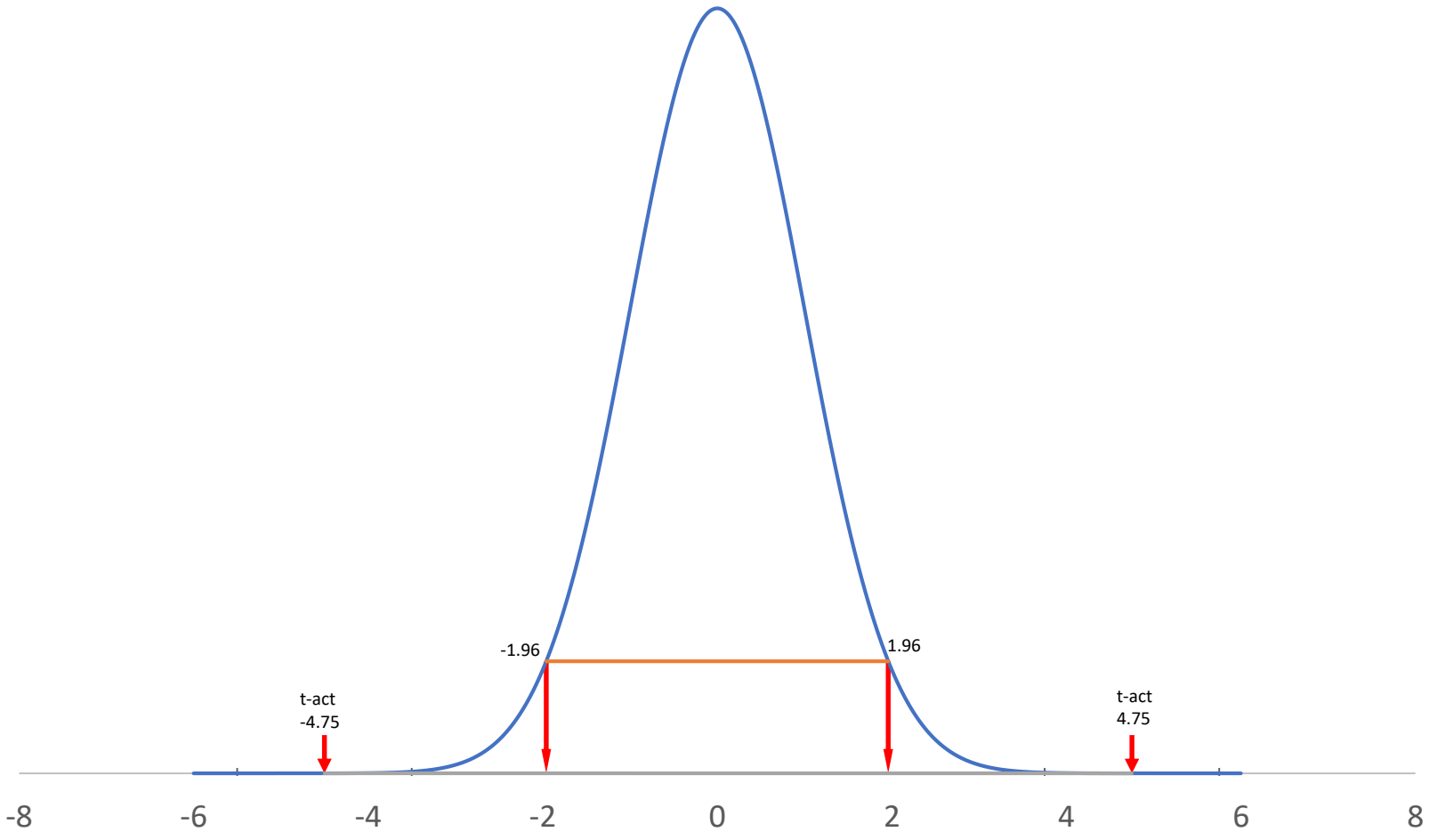
Testing hypothesis concerning the slope coefficient

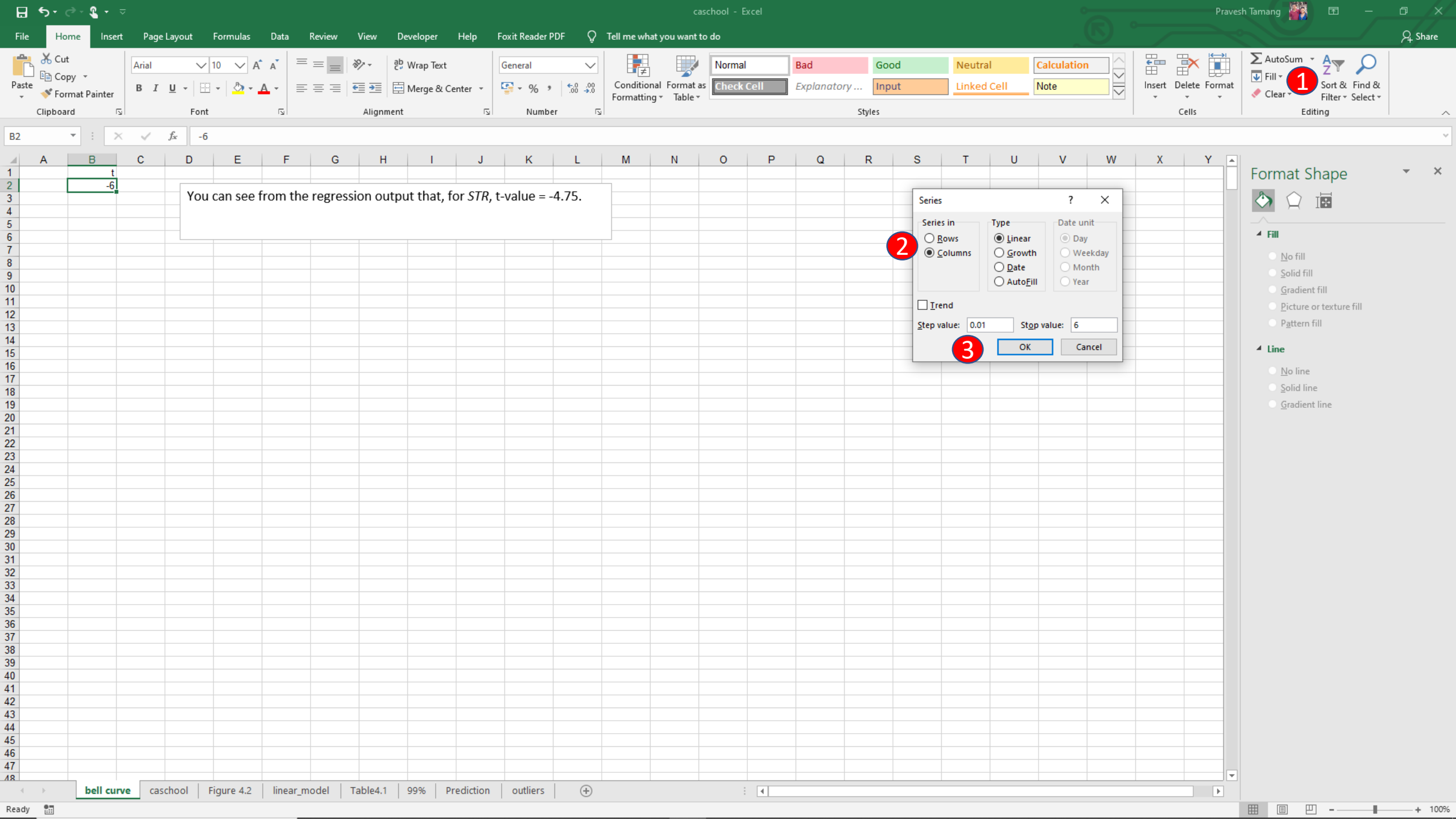
Do smaller classes lead to higher scores?

- Our regression equation is $\hat{TestScore} = \beta_0 + \beta_1 STR$
- Null hypothesis: $H_0 : \beta_1 = 0$
- Alternative hypothesis: $H_0 : \beta_1 < 0$

After inspecting the regression output, reject the null hypothesis at the 5% significance level if the *p*-value is less than 0.05 or, equivalently, if $|t_{act}| > 1.96$.

Graphical inspection of p-value


-1.96
1.96
t-act
-4.75
t-act
4.75
-8
-6
-4
-2
0
2
4
6
8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1
B2
-6
t
-6
You can see from the regression output that, for STR, t-value = -4.75.
Series
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Rows
Columns
Type
Linear
Growth
Date
AutoFill
Date unit
Day
Weekday
Month
Year
Trend
Step value:
0.01
Stop value:
6
OK
Cancel
2
3
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Gradient fill
Picture or texture fill
Pattern fill
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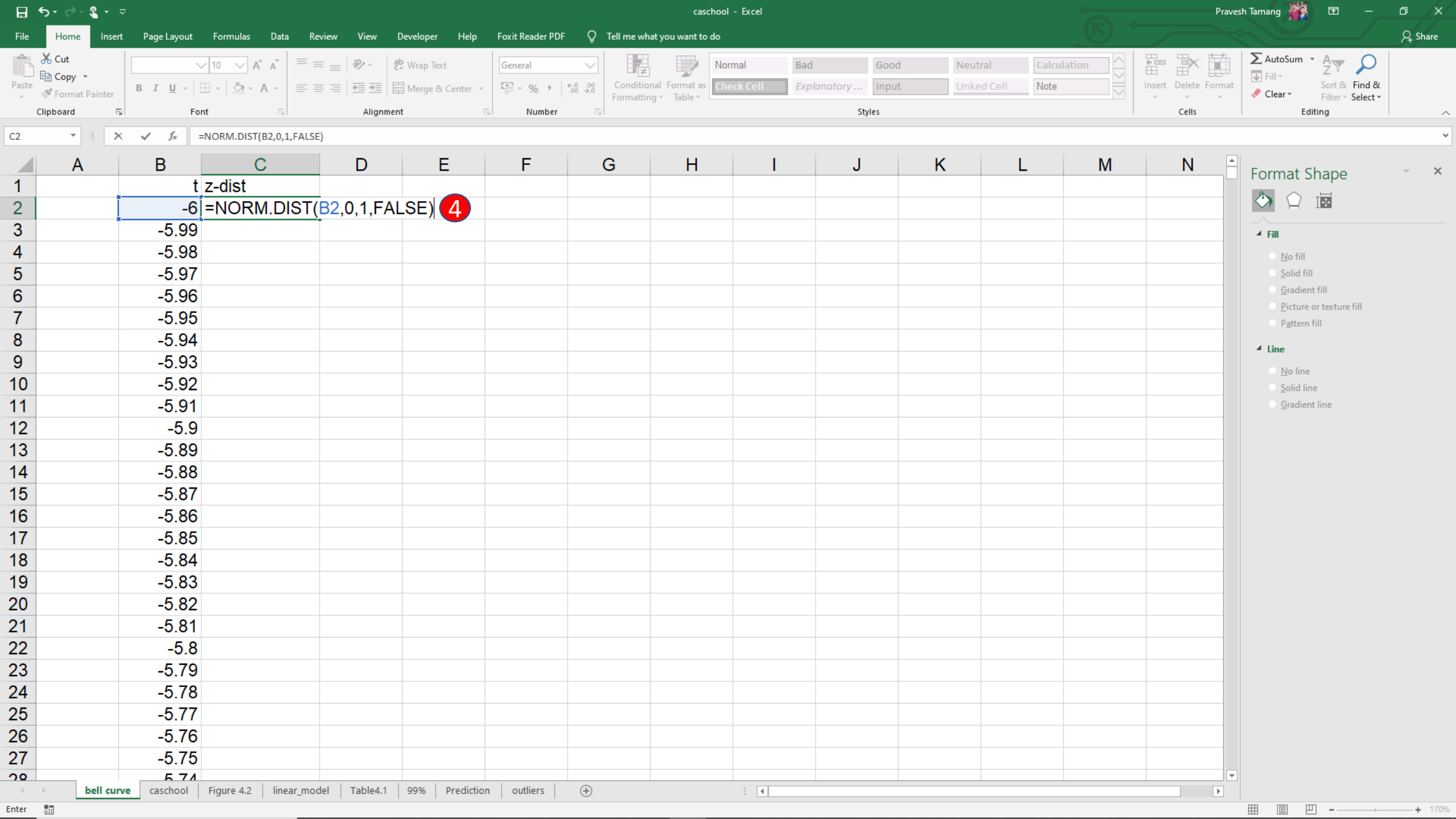
No line
Solid line
Gradient line
bell curve
caschool
Figure 4.2
linear_model
Table4.1
99%
Prediction
outliers
Ready
100%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Number
Conditional Formatting Format as Table
Normal Bad Good Neutral Calculation Check Cell Explanatory ... Input Linked Cell Note
Styles
Insert Delete Format
Cells
AutoSum Fill Clear Sort & Filter Find & Select
Editing
C2
=NORM.DIST(B2,0,1,FALSE)
t z-dist
-6 =NORM.DIST(B2,0,1,FALSE)
4
-5.99
-5.98
-5.97
-5.96
-5.95
-5.94
-5.93
-5.92
-5.91
-5.9
-5.89
-5.88
-5.87
-5.86
-5.85
-5.84
-5.83
-5.82
-5.81
-5.8
-5.79
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-5.76
-5.75
Format Shape
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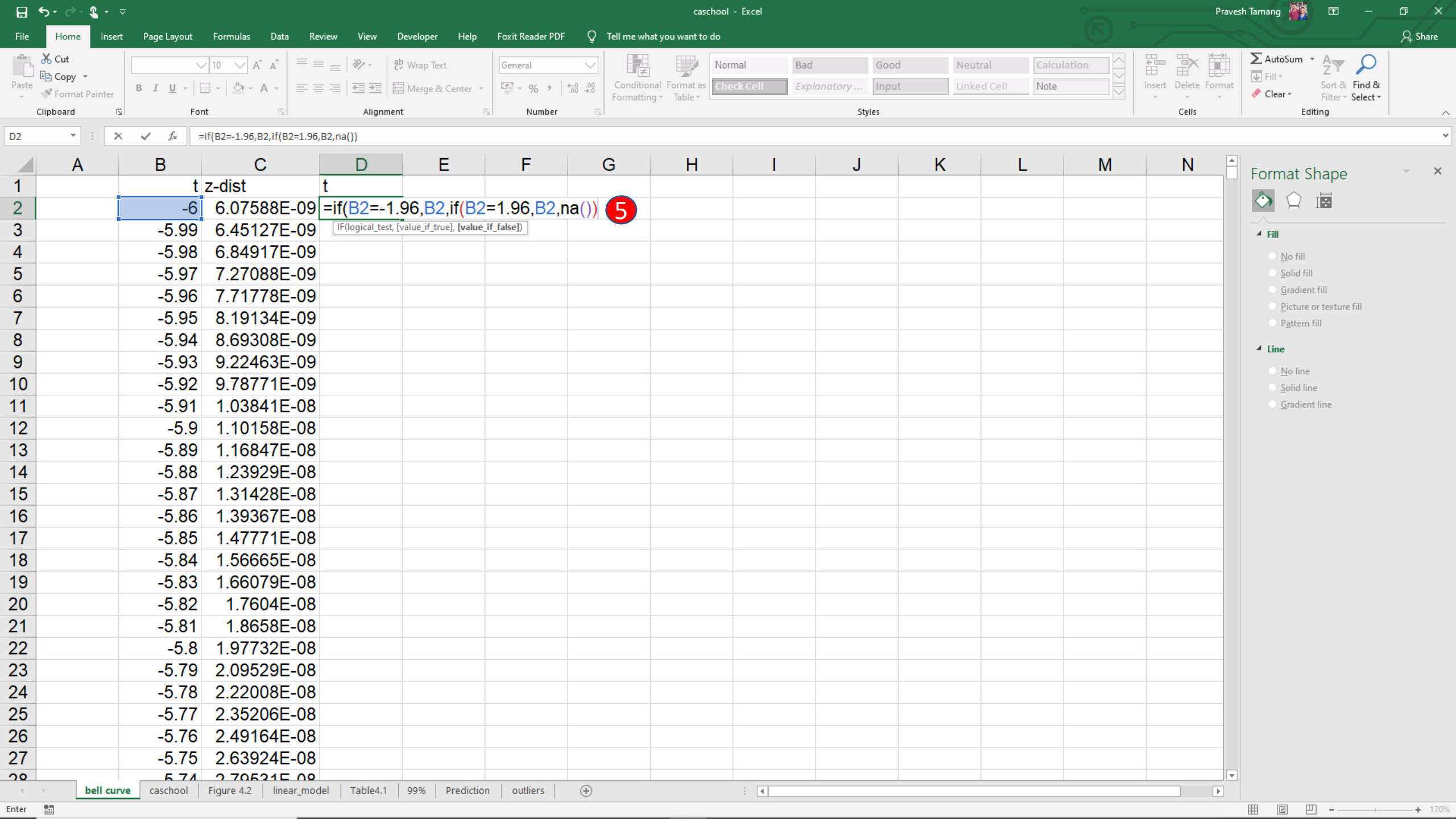
Gradient line
bell curve caschool Figure 4.2 linear_model Table4.1 99% Prediction outliers
Enter
170%



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		t	z-dist	t										
2		-6	6.07588E-09	=if(B2=-1.96,B2,if(B2=1.96,B2,na())										
3		-5.99	6.45127E-09											
4		-5.98	6.84917E-09											
5		-5.97	7.27088E-09											
6		-5.96	7.71778E-09											
7		-5.95	8.19134E-09											
8		-5.94	8.69308E-09											
9		-5.93	9.22463E-09											
10		-5.92	9.78771E-09											
11		-5.91	1.03841E-08											
12		-5.9	1.10158E-08											
13		-5.89	1.16847E-08											
14		-5.88	1.23929E-08											
15		-5.87	1.31428E-08											
16		-5.86	1.39367E-08											
17		-5.85	1.47771E-08											
18		-5.84	1.56665E-08											
19		-5.83	1.66079E-08											
20		-5.82	1.7604E-08											
21		-5.81	1.8658E-08											
22		-5.8	1.97732E-08											
23		-5.79	2.09529E-08											
24		-5.78	2.22008E-08											
25		-5.77	2.35206E-08											
26		-5.76	2.49164E-08											
27		-5.75	2.63924E-08											

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Number General

Conditional Formatting Format as Table

Normal Bad Good Neutral Calculation Check Cell Explanatory ... Input Linked Cell Note Styles

Insert Delete Format Cells

AutoSum Fill Clear Sort & Filter Find & Select Editing

E2 =if(B2=4.75,B2,if(B2=-4.5,B2,na()))

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		t	z-dist	t	t-act									
2		-6	6.07588E-09	#N/A	=if(B2=4.75,B2,if(B2=-4.5,B2,na()))									
3		-5.99	6.45127E-09	#N/A										
4		-5.98	6.84917E-09	#N/A										
5		-5.97	7.27088E-09	#N/A										
6		-5.96	7.71778E-09	#N/A										
7		-5.95	8.19134E-09	#N/A										
8		-5.94	8.69308E-09	#N/A										
9		-5.93	9.22463E-09	#N/A										
10		-5.92	9.78771E-09	#N/A										
11		-5.91	1.03841E-08	#N/A										
12		-5.9	1.10158E-08	#N/A										
13		-5.89	1.16847E-08	#N/A										
14		-5.88	1.23929E-08	#N/A										
15		-5.87	1.31428E-08	#N/A										
16		-5.86	1.39367E-08	#N/A										
17		-5.85	1.47771E-08	#N/A										
18		-5.84	1.56665E-08	#N/A										
19		-5.83	1.66079E-08	#N/A										
20		-5.82	1.7604E-08	#N/A										
21		-5.81	1.8658E-08	#N/A										
22		-5.8	1.97732E-08	#N/A										
23		-5.79	2.09529E-08	#N/A										
24		-5.78	2.22008E-08	#N/A										
25		-5.77	2.35206E-08	#N/A										
26		-5.76	2.49164E-08	#N/A										
27		-5.75	2.63924E-08	#N/A										

6

Format Shape

Fill
No fill
Solid fill
Gradient fill
Picture or texture fill
Pattern fill

Line
No line
Solid line
Gradient line

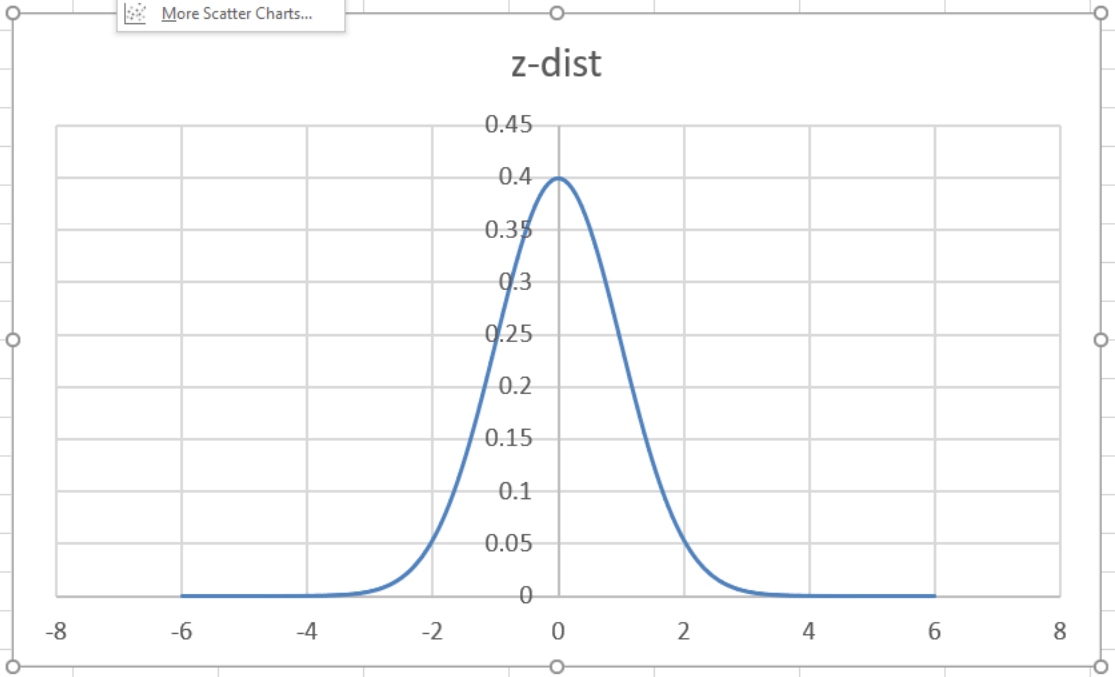
bell curve | caschool | Figure 4.2 | linear_model | Table4.1 | 99% | Prediction | outliers

Enter

Chart 6

	t	z-dist	t-value	t-act
2	-6	6.07588E-09	#N/A	#N/A
3	-5.99	6.45127E-09	#N/A	#N/A
4	-5.98	6.84917E-09	#N/A	#N/A
5	-5.97	7.27088E-09	#N/A	#N/A
6	-5.96	7.71778E-09	#N/A	#N/A
7	-5.95	8.19134E-09	#N/A	#N/A
8	-5.94	8.69308E-09	#N/A	#N/A
9	-5.93	9.22463E-09	#N/A	#N/A
10	-5.92	9.78771E-09	#N/A	#N/A
11	-5.91	1.03841E-08	#N/A	#N/A
12	-5.9	1.10158E-08	#N/A	#N/A
13	-5.89	1.16847E-08	#N/A	#N/A
14	-5.88	1.23929E-08	#N/A	#N/A
15	-5.87	1.31428E-08	#N/A	#N/A
16	-5.86	1.39367E-08	#N/A	#N/A
17	-5.85	1.47771E-08	#N/A	#N/A
18	-5.84	1.56665E-08	#N/A	#N/A
19	-5.83	1.66079E-08	#N/A	#N/A
20	-5.82	1.7604E-08	#N/A	#N/A
21	-5.81	1.8658E-08	#N/A	#N/A
22	-5.8	1.97732E-08	#N/A	#N/A
23	-5.79	2.09529E-08	#N/A	#N/A
24	-5.78	2.22008E-08	#N/A	#N/A
25	-5.77	2.35206E-08	#N/A	#N/A
26	-5.76	2.49164E-08	#N/A	#N/A
27	-5.75	2.63924E-08	#N/A	#N/A

Scatter
Bubble
More Scatter Charts...



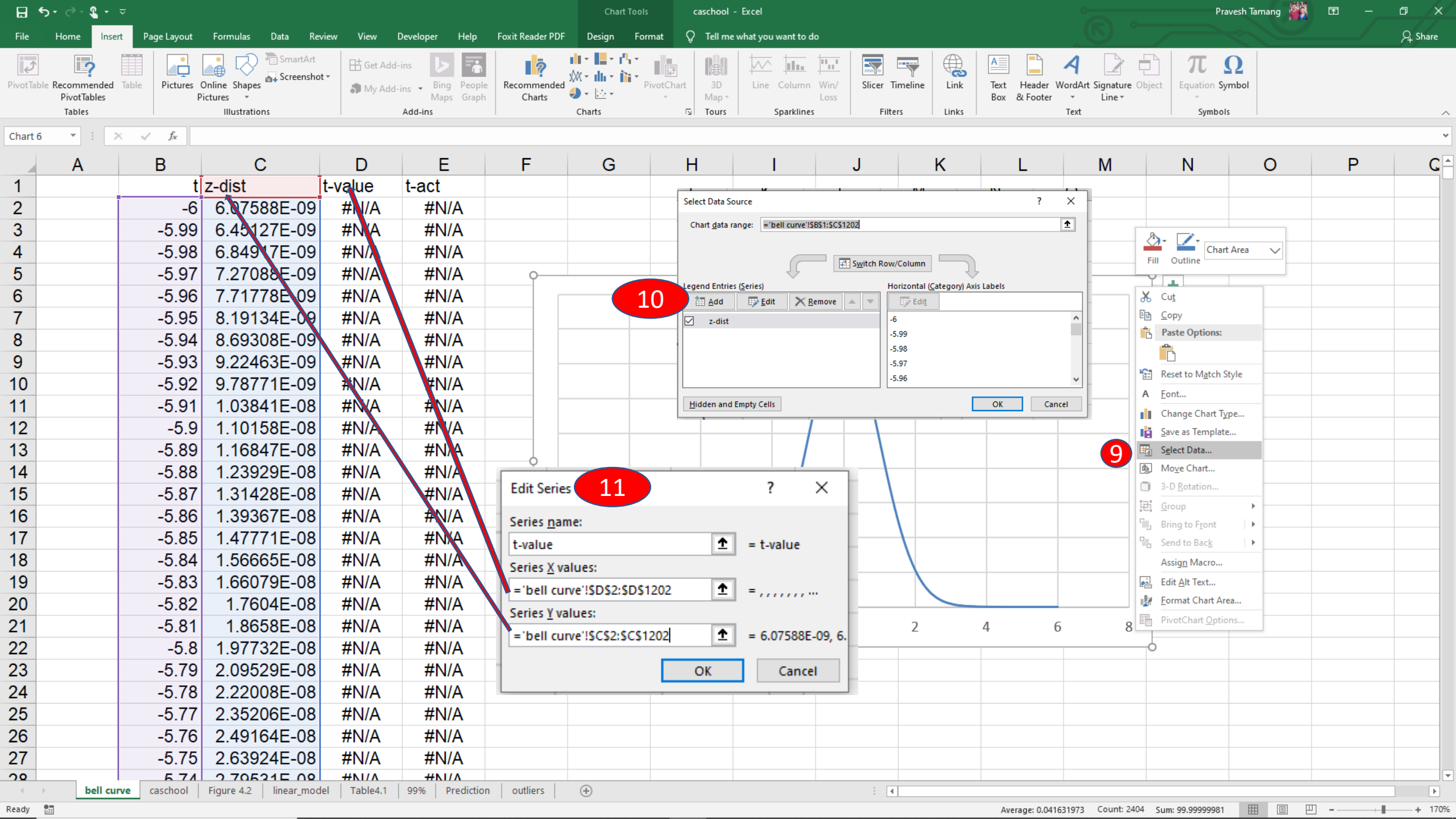

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Chart 6
t z-dist t-value t-act
-6 6.07588E-09 #N/A #N/A
-5.99 6.45127E-09 #N/A #N/A
-5.98 6.84917E-09 #N/A #N/A
-5.97 7.27088E-09 #N/A #N/A
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-5.94 8.69308E-09 #N/A #N/A
-5.93 9.22463E-09 #N/A #N/A
-5.92 9.78771E-09 #N/A #N/A
-5.91 1.03841E-08 #N/A #N/A
-5.9 1.10158E-08 #N/A #N/A
-5.89 1.16847E-08 #N/A #N/A
-5.88 1.23929E-08 #N/A #N/A
-5.87 1.31428E-08 #N/A #N/A
-5.86 1.39367E-08 #N/A #N/A
-5.85 1.47771E-08 #N/A #N/A
-5.84 1.56665E-08 #N/A #N/A
-5.83 1.66079E-08 #N/A #N/A
-5.82 1.7604E-08 #N/A #N/A
-5.81 1.8658E-08 #N/A #N/A
-5.8 1.97732E-08 #N/A #N/A
-5.79 2.09529E-08 #N/A #N/A
-5.78 2.22008E-08 #N/A #N/A
-5.77 2.35206E-08 #N/A #N/A
-5.76 2.49164E-08 #N/A #N/A
-5.75 2.63924E-08 #N/A #N/A
Select Data Source
Chart data range: ='bell curve'!$B$1:$C$1202
Switch Row/Column
Legend Entries (Series)
Add Edit Remove
z-dist
Horizontal (Category) Axis Labels
Edit
-6
-5.99
-5.98
-5.97
-5.96
Hidden and Empty Cells
OK Cancel
10
Edit Series
11
Series name:
t-value
= t-value
Series X values:
='bell curve'!$D$2:$D$1202
Series Y values:
='bell curve'!$C$2:$C$1202
= 6.07588E-09, 6.
OK Cancel
Fill Outline Chart Area
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Change Chart Type...
Save as Template...
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Group
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Send to Back
Assign Macro...
Edit Alt Text...
Format Chart Area...
PivotChart Options...
2 4 6 8
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Ready
Average: 0.041631973 Count: 2404 Sum: 99.99999981
170%

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Equation | Symbol — Symbols

E8 =IF(B8=4.75,B8,IF(B8=-4.5,B8,NA()))

	A	B	C	D	E
1		t	z-dist	t-value	t-act
2		-6	6.07588E-09	#N/A	#N/A
3		-5.99	6.45127E-09	#N/A	#N/A
4		-5.98	6.84917E-09	#N/A	#N/A
5		-5.97	7.27088E-09	#N/A	#N/A
6		-5.96	7.71778E-09	#N/A	#N/A
7		-5.95	8.19134E-09	#N/A	#N/A
8		-5.94	8.69308E-09	#N/A	#N/A
9		-5.93	9.22463E-09	#N/A	#N/A
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13		-5.89	1.16847E-08	#N/A	#N/A
14		-5.88	1.23929E-08	#N/A	#N/A
15		-5.87	1.31428E-08	#N/A	#N/A
16		-5.86	1.39367E-08	#N/A	#N/A
17		-5.85	1.47771E-08	#N/A	#N/A
18		-5.84	1.56665E-08	#N/A	#N/A
19		-5.83	1.66079E-08	#N/A	#N/A
20		-5.82	1.7604E-08	#N/A	#N/A
21		-5.81	1.8658E-08	#N/A	#N/A
22		-5.8	1.97732E-08	#N/A	#N/A
23		-5.79	2.09529E-08	#N/A	#N/A
24		-5.78	2.22008E-08	#N/A	#N/A
25		-5.77	2.35206E-08	#N/A	#N/A
26		-5.76	2.49164E-08	#N/A	#N/A
27		-5.75	2.63924E-08	#N/A	#N/A

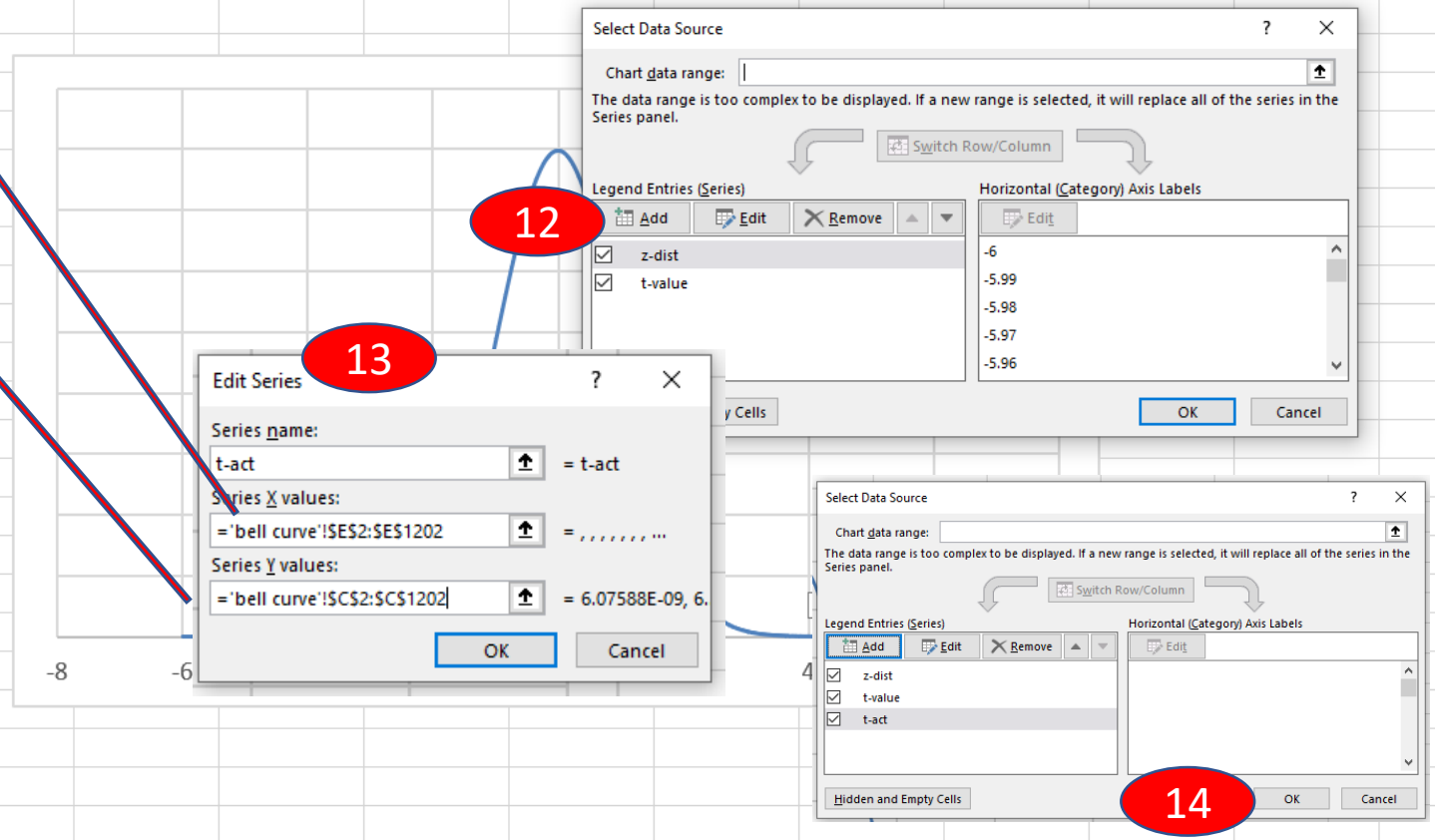

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Chart 6

	A	B	C	D	E
1		t	z-dist	t-value	t-act
2		-6	6.07588E-09	#N/A	#N/A
3		-5.99	6.45127E-09	#N/A	#N/A
4		-5.98	6.84917E-09	#N/A	#N/A
5		-5.97	7.27088E-09	#N/A	#N/A
6		-5.96	7.71778E-09	#N/A	#N/A
7		-5.95	8.19134E-09	#N/A	#N/A
8		-5.94	8.69308E-09	#N/A	#N/A
9		-5.93	9.22463E-09	#N/A	#N/A
10		-5.92	9.78771E-09	#N/A	#N/A
11		-5.91	1.03841E-08	#N/A	#N/A
12		-5.9	1.10158E-08	#N/A	#N/A
13		-5.89	1.16847E-08	#N/A	#N/A
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15		-5.87	1.31428E-08	#N/A	#N/A
16		-5.86	1.39367E-08	#N/A	#N/A
17		-5.85	1.47771E-08	#N/A	#N/A
18		-5.84	1.56665E-08	#N/A	#N/A
19		-5.83	1.66079E-08	#N/A	#N/A
20		-5.82	1.7604E-08	#N/A	#N/A
21		-5.81	1.8658E-08	#N/A	#N/A
22		-5.8	1.97732E-08	#N/A	#N/A
23		-5.79	2.09529E-08	#N/A	#N/A
24		-5.78	2.22008E-08	#N/A	#N/A
25		-5.77	2.35206E-08	#N/A	#N/A
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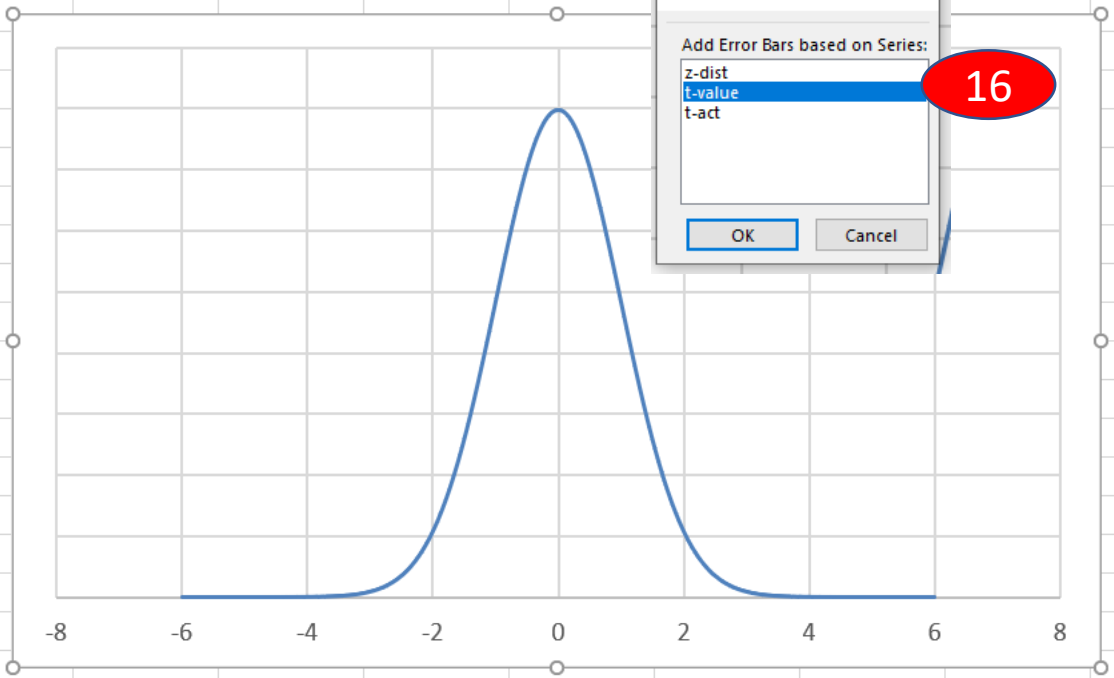
27		-5.75	2.63924E-08	#N/A	#N/A



Add Error Bars

Add Error Bars based on Series:

z-dist
t-value
t-act

OK Cancel

16

Chart Elements

Axes
Axis Titles
Chart Title
Data Labels
Error Bars
Gridlines
Legend
Trendline

15

Standard Error
Percentage
Standard Deviation
More Options...

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Ready 170%

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Chart 6

	A	B	C	D	E
1		t	z-dist	t-value	t-act
2		-6	6.07588E-09	#N/A	#N/A
3		-5.99	6.45127E-09	#N/A	#N/A
4		-5.98	6.84917E-09	#N/A	#N/A
5		-5.97	7.27088E-09	#N/A	#N/A
6		-5.96	7.71778E-09	#N/A	#N/A
7		-5.95	8.19134E-09	#N/A	#N/A
8		-5.94	8.69308E-09	#N/A	#N/A
9		-5.93	9.22463E-09	#N/A	#N/A
10		-5.92	9.78771E-09	#N/A	#N/A
11		-5.91	1.03841E-08	#N/A	#N/A
12		-5.9	1.10158E-08	#N/A	#N/A
13		-5.89	1.16847E-08	#N/A	#N/A
14		-5.88	1.23929E-08	#N/A	#N/A
15		-5.87	1.31428E-08	#N/A	#N/A
16		-5.86	1.39367E-08	#N/A	#N/A
17		-5.85	1.47771E-08	#N/A	#N/A
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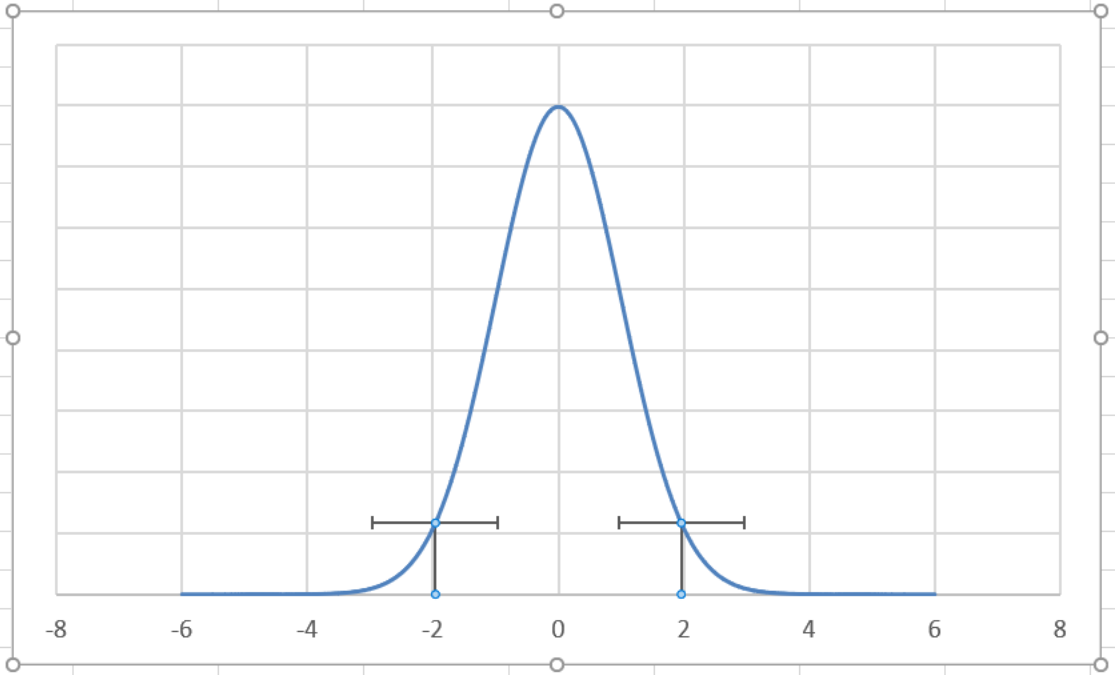
19		-5.83	1.66079E-08	#N/A	#N/A
20		-5.82	1.7604E-08	#N/A	#N/A
21		-5.81	1.8658E-08	#N/A	#N/A
22		-5.8	1.97732E-08	#N/A	#N/A
23		-5.79	2.09529E-08	#N/A	#N/A
24		-5.78	2.22008E-08	#N/A	#N/A
25		-5.77	2.35206E-08	#N/A	#N/A
26		-5.76	2.49164E-08	#N/A	#N/A
27		-5.75	2.63924E-08	#N/A	#N/A



Format Error Bars

Error Bar Options

Vertical Error Bar

Direction
- Both
- Minus
- Plus

17

End Style
- No Cap
- Cap

18

Error Amount
- Fixed value 1.0
- Percentage 100 %
- Standard deviation(s) 1.0
- Standard error
- Custom Specify Value

19

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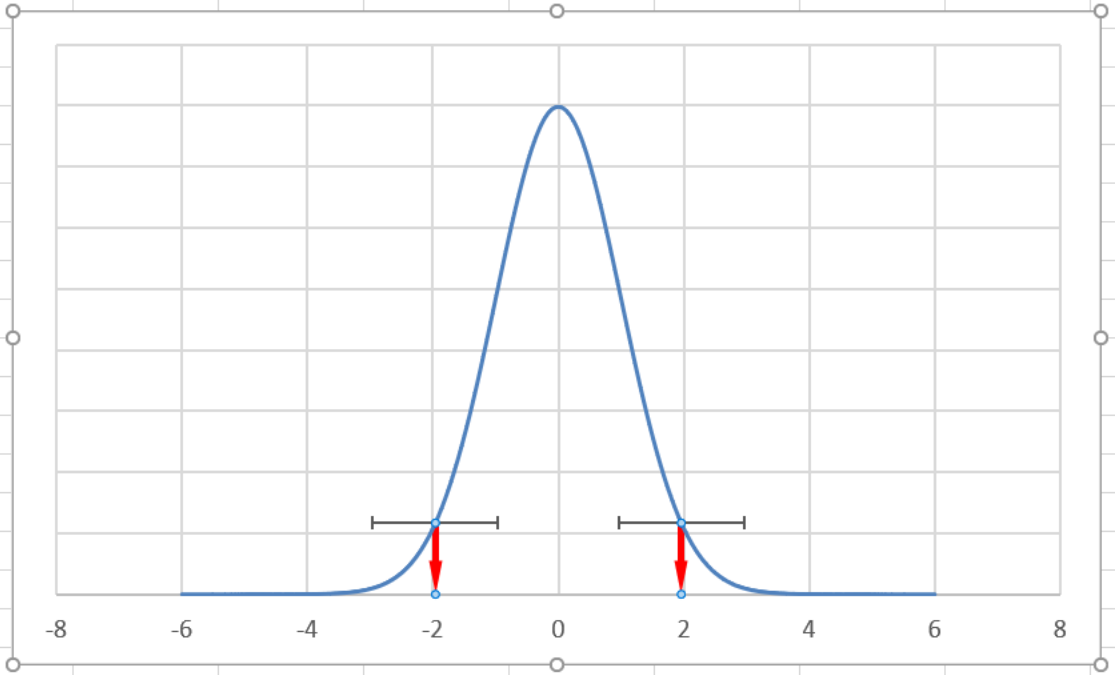
Chart 6

	A	B	C	D	E
1		t	z-dist	t-value	t-act
2		-6	6.07588E-09	#N/A	#N/A
3		-5.99	6.45127E-09	#N/A	#N/A
4		-5.98	6.84917E-09	#N/A	#N/A
5		-5.97	7.27088E-09	#N/A	#N/A
6		-5.96	7.71778E-09	#N/A	#N/A
7		-5.95	8.19134E-09	#N/A	#N/A
8		-5.94	8.69308E-09	#N/A	#N/A
9		-5.93	9.22463E-09	#N/A	#N/A
10		-5.92	9.78771E-09	#N/A	#N/A
11		-5.91	1.03841E-08	#N/A	#N/A
12		-5.9	1.10158E-08	#N/A	#N/A
13		-5.89	1.16847E-08	#N/A	#N/A
14		-5.88	1.23929E-08	#N/A	#N/A
15		-5.87	1.31428E-08	#N/A	#N/A
16		-5.86	1.39367E-08	#N/A	#N/A
17		-5.85	1.47771E-08	#N/A	#N/A
18		-5.84	1.56665E-08	#N/A	#N/A
19		-5.83	1.66079E-08	#N/A	#N/A
20		-5.82	1.7604E-08	#N/A	#N/A
21		-5.81	1.8658E-08	#N/A	#N/A
22		-5.8	1.97732E-08	#N/A	#N/A
23		-5.79	2.09529E-08	#N/A	#N/A
24		-5.78	2.22008E-08	#N/A	#N/A
25		-5.77	2.35206E-08	#N/A	#N/A
26		-5.76	2.49164E-08	#N/A	#N/A
27		-5.75	2.63924E-08	#N/A	#N/A



Format Error Bars

Error Bar Options

20

Line

No line
Solid line
Gradient line
Automatic

21

Color
Transparency 0%
Width 2 pt
Compound type
Dash type
Cap type Flat
Join type Round
Begin Arrow type
Begin Arrow size
End Arrow type
End Arrow size

22

bell curve | caschool | Figure 4.2 | linear_model | Table4.1 | 99% | Prediction | outliers

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170%

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Chart 6

	A	B	C	D	E
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8		-5.94	8.69308E-09	#N/A	#N/A
9		-5.93	9.22463E-09	#N/A	#N/A
10		-5.92	9.78771E-09	#N/A	#N/A
11		-5.91	1.03841E-08	#N/A	#N/A
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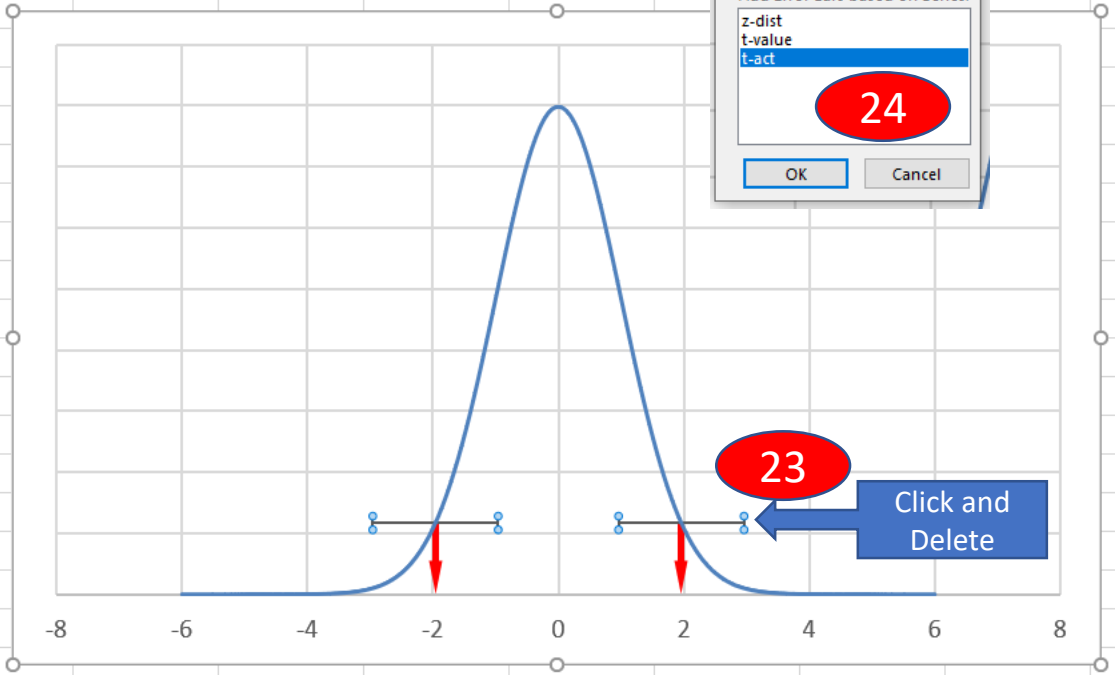
22		-5.8	1.97732E-08	#N/A	#N/A
23		-5.79	2.09529E-08	#N/A	#N/A
24		-5.78	2.22008E-08	#N/A	#N/A
25		-5.77	2.35206E-08	#N/A	#N/A
26		-5.76	2.49164E-08	#N/A	#N/A
27		-5.75	2.63924E-08	#N/A	#N/A



Format Error Bars
Error Bar Options
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Solid line
Gradient line
Automatic
Color
Transparency 0%
Width 0.75 pt
Compound type
Dash type
Cap type Flat
Join type Round
Begin Arrow type
Begin Arrow size
End Arrow type
End Arrow size

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Ready 170%

Chart 6

	A	B	C	D	E
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20		-5.82	1.7604E-08	#N/A	#N/A
21		-5.81	1.8658E-08	#N/A	#N/A
22		-5.8	1.97732E-08	#N/A	#N/A
23		-5.79	2.09529E-08	#N/A	#N/A
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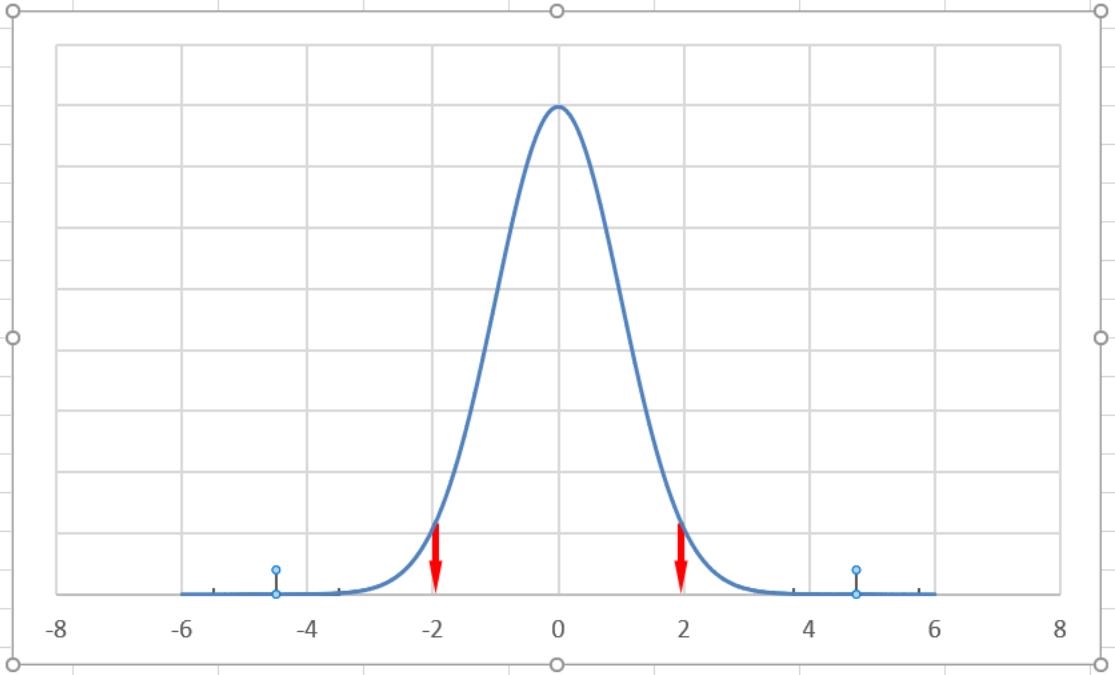
25		-5.77	2.35206E-08	#N/A	#N/A
26		-5.76	2.49164E-08	#N/A	#N/A
27		-5.75	2.63924E-08	#N/A	#N/A



25

26

Format Error Bars

Error Bar Options

Vertical Error Bar

Direction

Both
Minus
Plus

End Style

No Cap
Cap

Error Amount

Fixed value 0.02
Percentage 0.8 %
Standard deviation(s) 1.0
Standard error
Custom Specify Value

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General
Normal Bad Good Neutral Calculation Check Cell Explanatory ... Input Linked Cell Note
Conditional Formatting Format as Table — Styles
Insert Delete Format — Cells
AutoSum Fill Clear Sort & Filter Find & Select — Editing

Chart 6

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22		-5.8	1.97732E-08	#N/A	#N/A
23		-5.79	2.09529E-08	#N/A	#N/A
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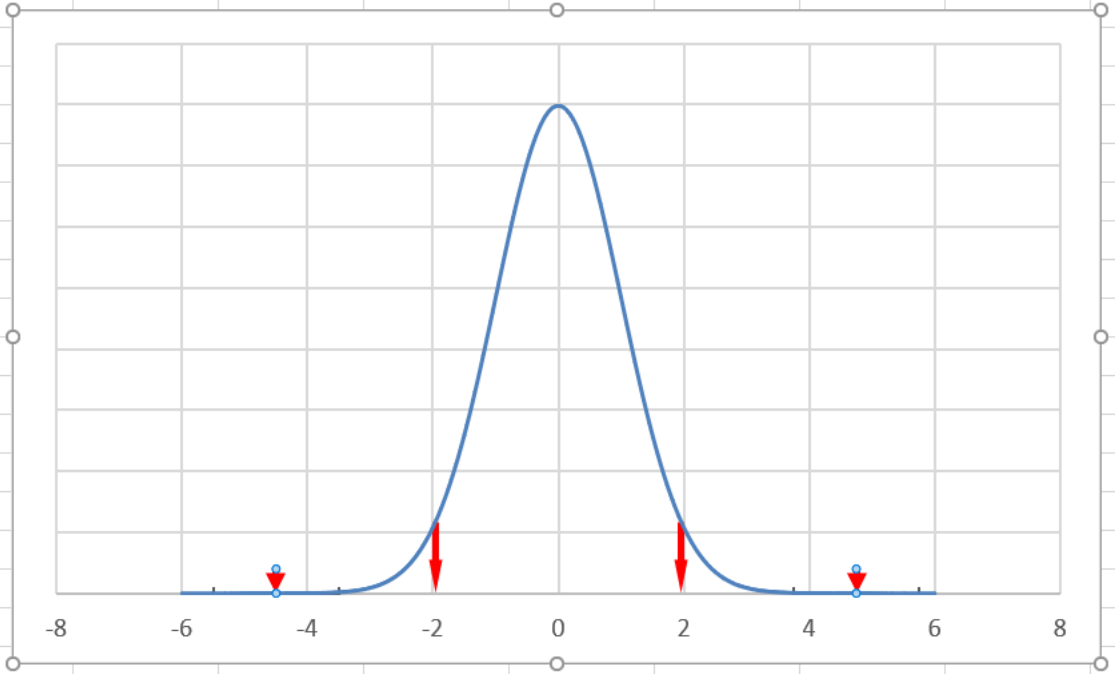
25		-5.77	2.35206E-08	#N/A	#N/A
26		-5.76	2.49164E-08	#N/A	#N/A
27		-5.75	2.63924E-08	#N/A	#N/A
28		-5.74	2.79531E-08	#N/A	#N/A



27

28

Format Error Bars
Error Bar Options
Line
No line
Solid line
Gradient line
Automatic
Color
Transparency 0%
Width 2 pt
Compound type
Dash type
Cap type Flat
Join type Round
Begin Arrow type
Begin Arrow size
End Arrow type
End Arrow size

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Confidence intervals for a regression coefficient

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Get External Data: From Access, From Web, From Text, From Other Sources, Existing Connections
Get & Transform: New Query, Show Queries, From Table, Recent Sources
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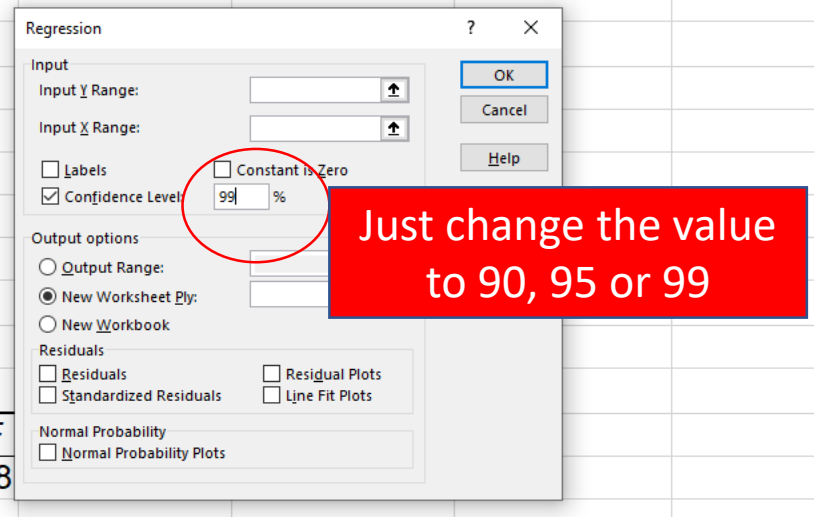
Data Types: Stocks, Geography
Sort & Filter: Sort, Filter, Clear, Reapply, Advanced
Data Tools: Text to Columns, Flash Fill, Remove Duplicates, Data Validation, Consolidate, Relationships, Manage Data Model
Forecast: What-If Analysis, Forecast Sheet
Outline: Group, Ungroup, Subtotal
Analysis: Data Analysis

H3

	A	B	C	D	E	F	G	H	I	J	K
1	SUMMARY OUTPUT										
2											
3	*Regression Statistics*										
4	Multiple R	0.226362751									
5	R Square	0.051240095									
6	Adjusted R Square	0.048970335									
7	Standard Error	18.5809675									
8	Observations	420									
9											
10	ANOVA										
11		*df*	*SS*	*MS*	*F*	*Significance F*					
12	Regression	1	7794.110041	7794.110041	22.57511055	0.0000028					
13	Residual	418	144315.4836	345.2523531							
14	Total	419	152109.5936								
15											
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*		
17	Intercept	698.9329523	9.467491444	73.82451375	0.0000000	680.323126	717.542779	680.323126	717.5427786		
18	str	-2.279808287	0.479825567	-4.75132724	0.0000028	-3.222980034	-1.33663654	-3.22298003	-1.33663654		
19											
20											
21											
22	RESIDUAL OUTPUT										
23											
24	*Observation*	*Predicted testscr*	*Residuals*								



Just change the value to 90, 95 or 99

bell curve | caschool | Figure 4.2 | linear_model | Table4.1 | 99% | Prediction | outliers

Ready

Regression when X is a binary variable

- **Equation with a binary regressor:**

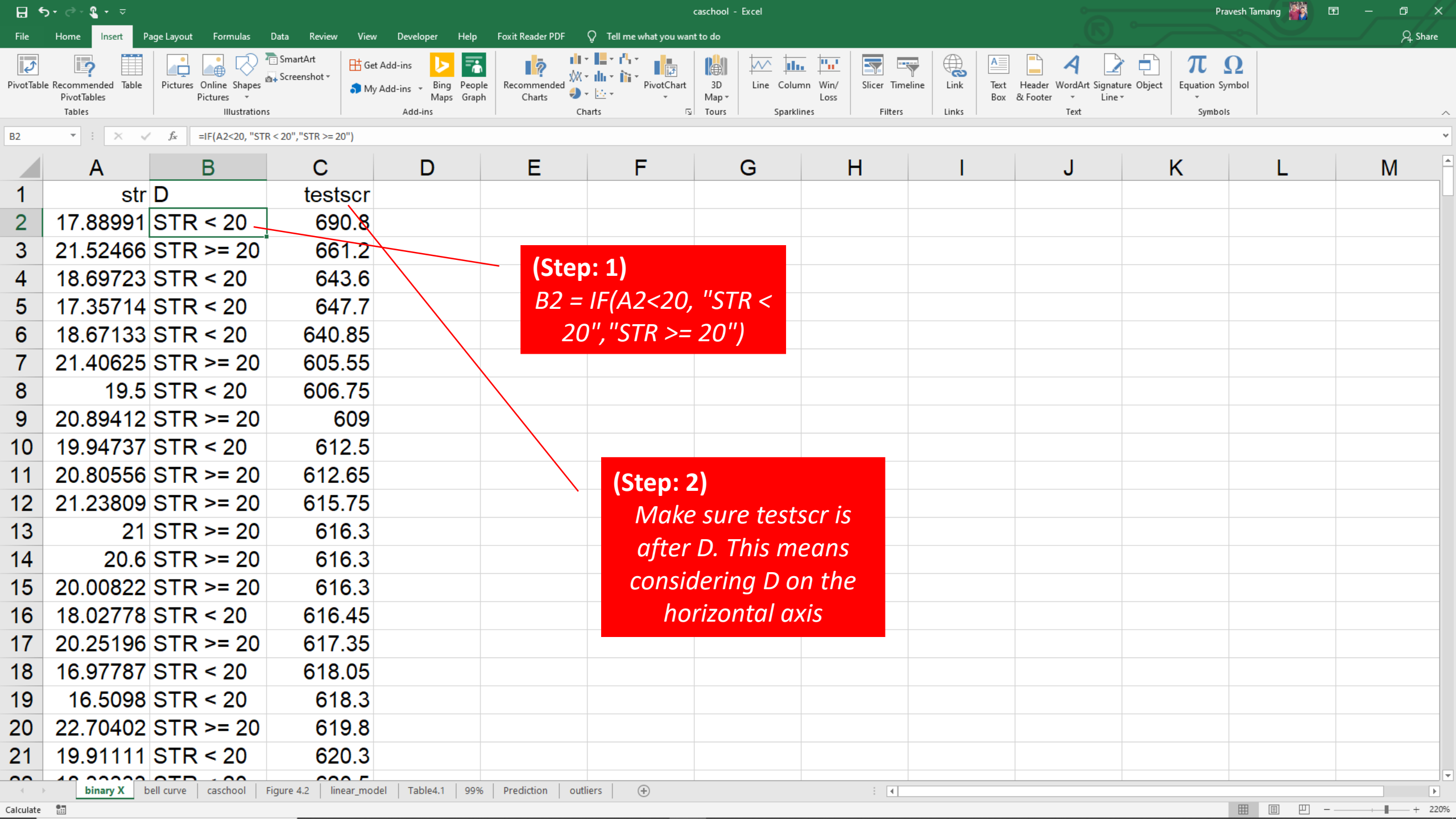
$$Y_i = \beta_0 + \beta_1 D_i + u_i$$

$$D_i = \begin{cases} 1 & \text{if } STR \text{ in } i^{th} \text{ school district} < 20 \\ 0 & \text{if } STR \text{ in } i^{th} \text{ school district} \geq 20 \end{cases}$$

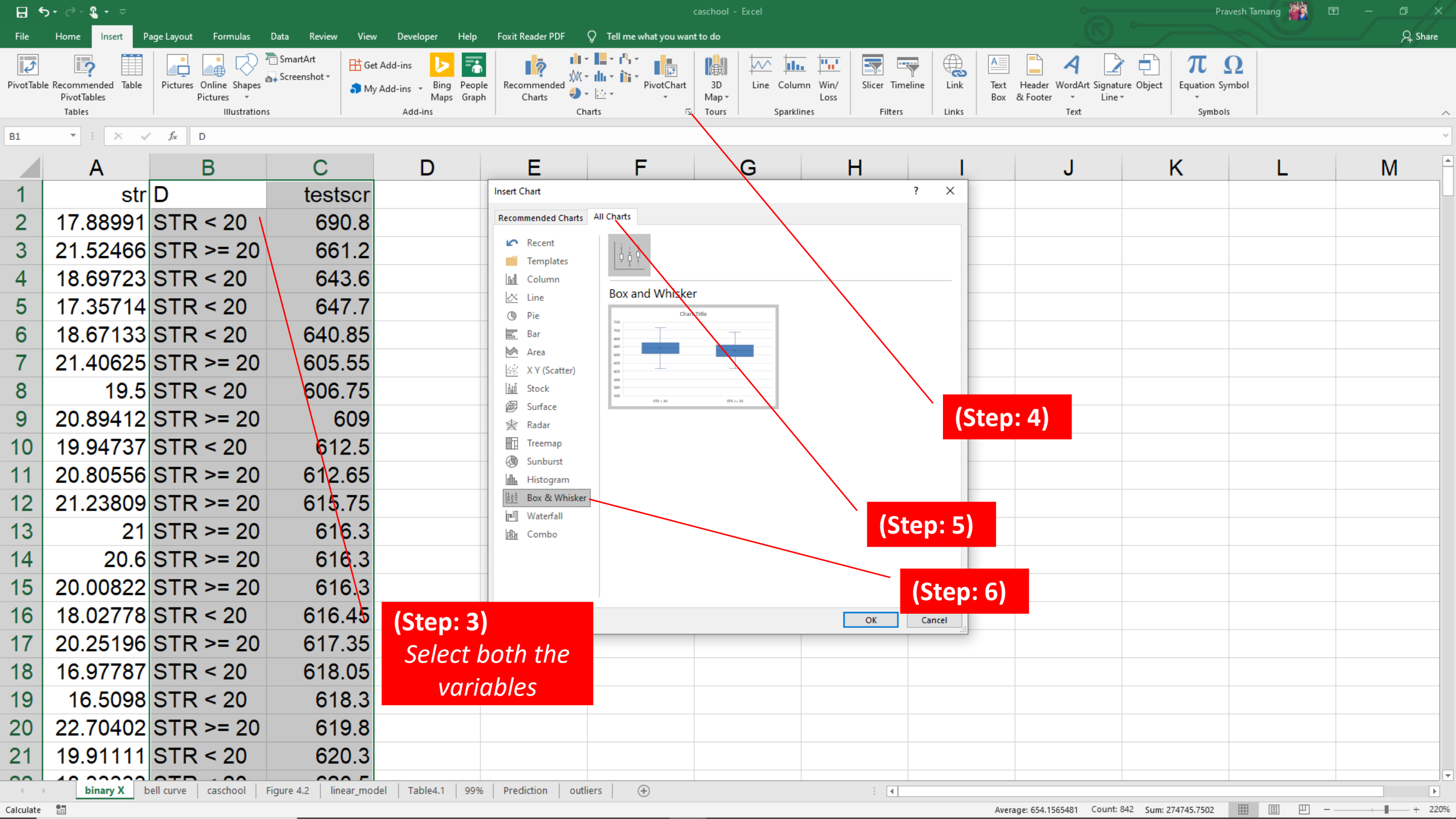
- Our regression model is

$$TestScore_i = \beta_0 + \beta_1 D_i + u_i.$$

What is the difference in the expected test scores in districts with lower student-teacher ratio $STR < 20 (D_i = 1)$ and those with higher student-teacher ratio $STR \geq 20 (D_i = 0)$?



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	str	D	testscr										
2	17.88991	STR < 20	690.8										
3	21.52466	STR >= 20	661.2										
4	18.69723	STR < 20	643.6										
5	17.35714	STR < 20	647.7										
6	18.67133	STR < 20	640.85										
7	21.40625	STR >= 20	605.55										
8	19.5	STR < 20	606.75										
9	20.89412	STR >= 20	609										
10	19.94737	STR < 20	612.5										
11	20.80556	STR >= 20	612.65										
12	21.23809	STR >= 20	615.75										
13	21	STR >= 20	616.3										
14	20.6	STR >= 20	616.3										
15	20.00822	STR >= 20	616.3										
16	18.02778	STR < 20	616.45										
17	20.25196	STR >= 20	617.35										
18	16.97787	STR < 20	618.05										
19	16.5098	STR < 20	618.3										
20	22.70402	STR >= 20	619.8										
21	19.91111	STR < 20	620.3										



	A	B	C
1	str	D	testscr
2	17.88991	STR < 20	690.8
3	21.52466	STR >= 20	661.2
4	18.69723	STR < 20	643.6
5	17.35714	STR < 20	647.7
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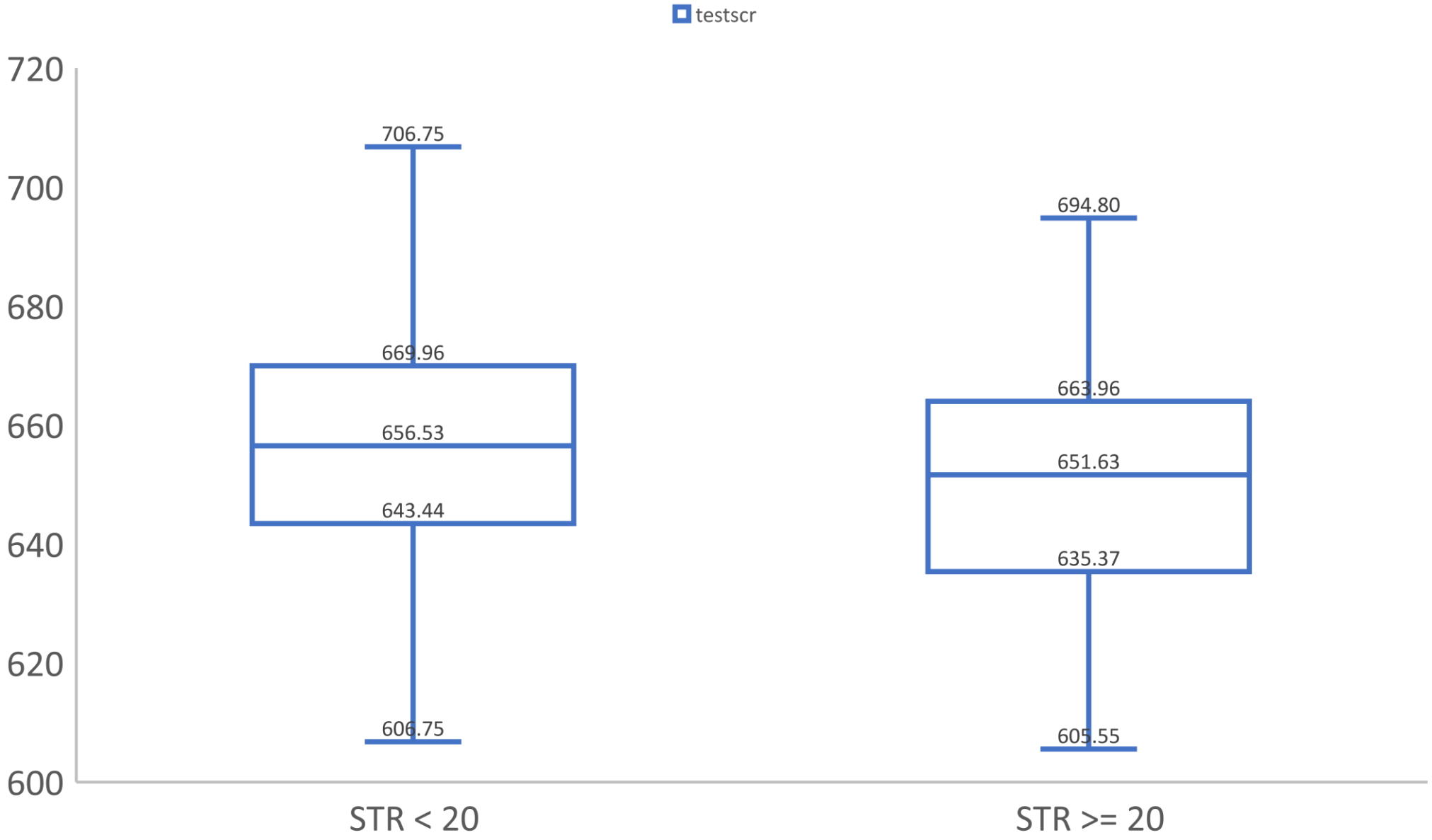
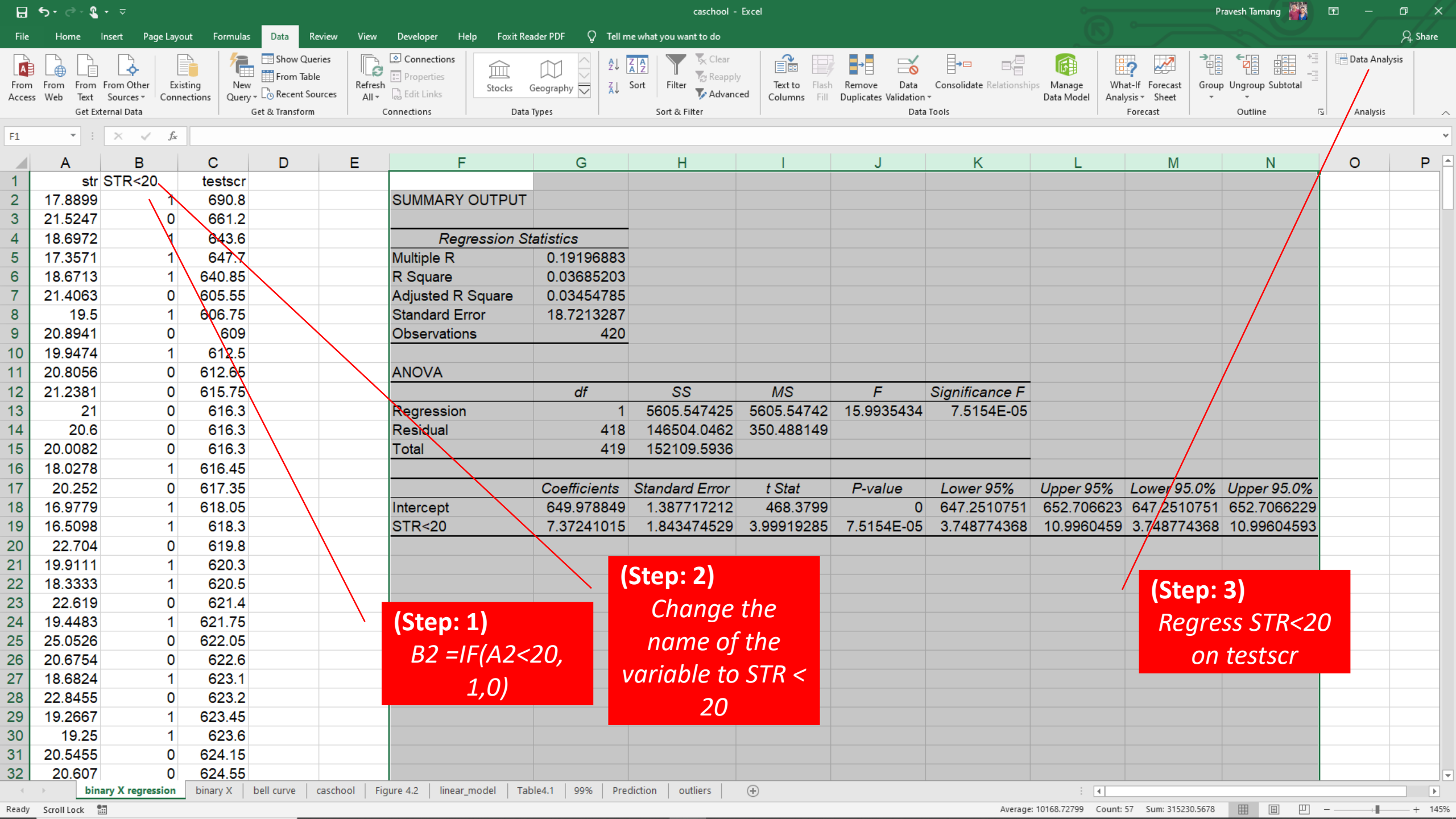
17	20.25196	STR >= 20	617.35
18	16.97787	STR < 20	618.05
19	16.5098	STR < 20	618.3
20	22.70402	STR >= 20	619.8
21	19.91111	STR < 20	620.3


testscr
720
700
680
660
640
620
600
706.75
669.96
656.53
643.44
606.75
694.80
663.96
651.63
635.37
605.55
STR < 20
STR >= 20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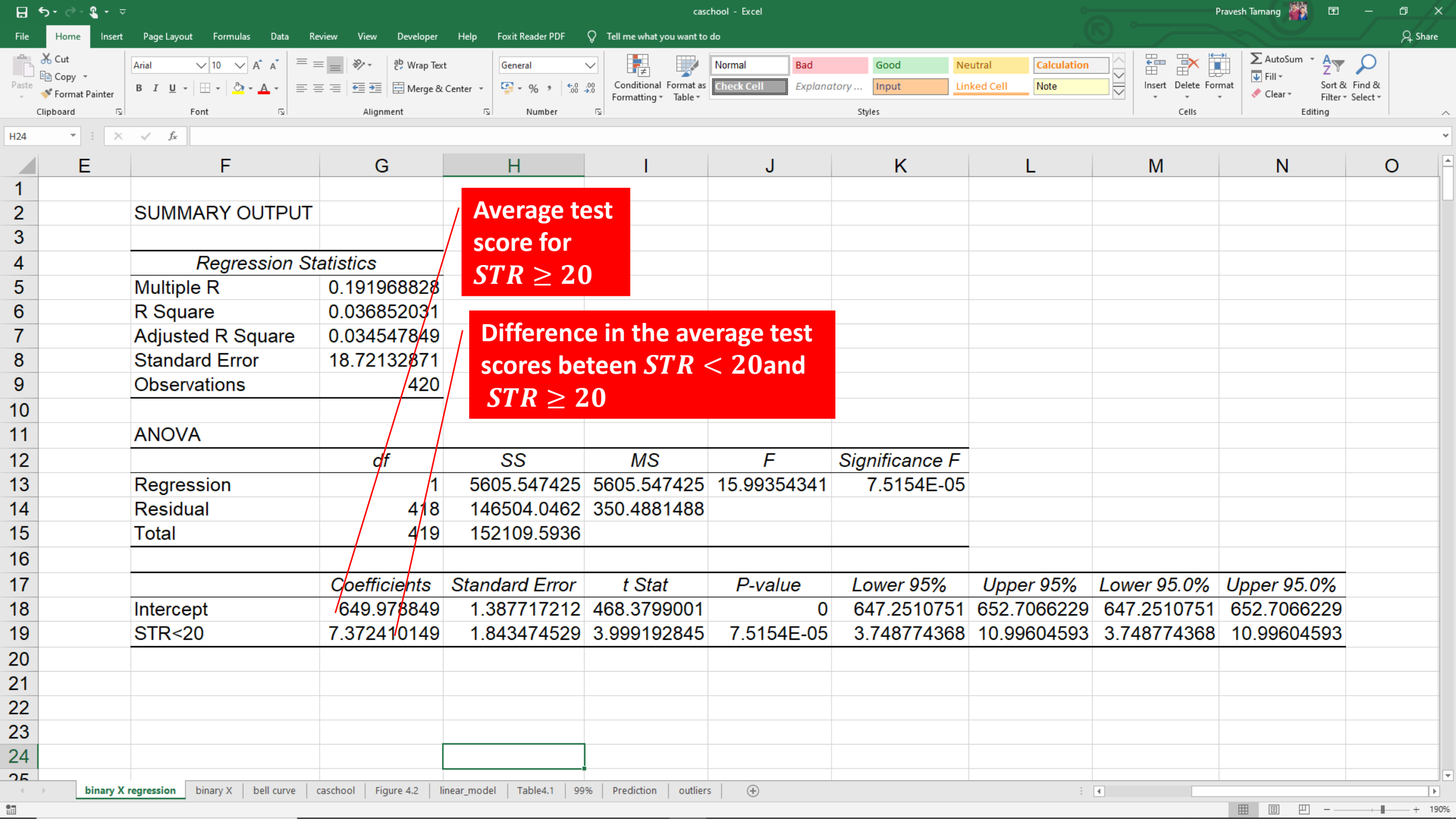
Sort Filter Clear Reapply Advanced Sort & Filter
Text to Columns Flash Fill Remove Duplicates Data Validation Consolidate Relationships Manage Data Model Data Tools
What-If Analysis Forecast Sheet Forecast
Group Ungroup Subtotal Outline
Data Analysis Analysis
F1
str STR<20 testscr
17.8899 1 690.8
21.5247 0 661.2
18.6972 1 643.6
17.3571 1 647.7
18.6713 1 640.85
21.4063 0 605.55
19.5 1 606.75
20.8941 0 609
19.9474 1 612.5
20.8056 0 612.65
21.2381 0 615.75
21 0 616.3
20.6 0 616.3
20.0082 0 616.3
18.0278 1 616.45
20.252 0 617.35
16.9779 1 618.05
16.5098 1 618.3
22.704 0 619.8
19.9111 1 620.3
18.3333 1 620.5
22.619 0 621.4
19.4483 1 621.75
25.0526 0 622.05
20.6754 0 622.6
18.6824 1 623.1
22.8455 0 623.2
19.2667 1 623.45
19.25 1 623.6
20.5455 0 624.15
20.607 0 624.55
SUMMARY OUTPUT
Regression Statistics
Multiple R 0.19196883
R Square 0.03685203
Adjusted R Square 0.03454785
Standard Error 18.7213287
Observations 420
ANOVA
df SS MS F Significance F
Regression 1 5605.547425 5605.54742 15.9935434 7.5154E-05
Residual 418 146504.0462 350.488149
Total 419 152109.5936
Coefficients Standard Error t Stat P-value Lower 95% Upper 95% Lower 95.0% Upper 95.0%
Intercept 649.978849 1.387717212 468.3799 0 647.2510751 652.706623 647.2510751 652.7066229
STR<20 7.37241015 1.843474529 3.99919285 7.5154E-05 3.748774368 10.9960459 3.748774368 10.99604593
(Step: 1) B2 =IF(A2<20, 1,0)
(Step: 2) Change the name of the variable to STR < 20
(Step: 3) Regress STR<20 on testscr
binary X regression binary X bell curve caschool Figure 4.2 linear_model Table4.1 99% Prediction outliers
Ready Scroll Lock
Average: 10168.72799 Count: 57 Sum: 315230.5678 145%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General Number
Conditional Formatting Format as Table
Normal Bad Good Neutral Calculation Check Cell Explanatory ... Input Linked Cell Note Styles
Insert Delete Format Cells
AutoSum Fill Clear Sort & Filter Find & Select Editing
H24
Average test score for $STR \geq 20$
Difference in the average test scores beteen $STR < 20$and $STR \geq 20$
SUMMARY OUTPUT
Regression Statistics
Multiple R 0.191968828
R Square 0.036852031
Adjusted R Square 0.034547849
Standard Error 18.72132871
Observations 420
ANOVA
df SS MS F Significance F
Regression 1 5605.547425 5605.547425 15.99354341 7.5154E-05
Residual 418 146504.0462 350.4881488
Total 419 152109.5936
Coefficients Standard Error t Stat P-value Lower 95% Upper 95% Lower 95.0% Upper 95.0%
Intercept 649.978849 1.387717212 468.3799001 0 647.2510751 652.7066229 647.2510751 652.7066229
STR<20 7.372410149 1.843474529 3.999192845 7.5154E-05 3.748774368 10.99604593 3.748774368 10.99604593
binary X regression binary X bell curve caschool Figure 4.2 linear_model Table4.1 99% Prediction outliers
190%

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General Number

Conditional Formatting Format as Table

Normal Bad Good Neutral Calculation Check Cell Explanatory ... Input Linked Cell Note Styles

Insert Delete Format Cells

AutoSum Fill Clear Sort & Filter Find & Select Editing

H24

	E	F	G	H	I	J	K	L	M	N	O
1											
2		SUMMARY OUTPUT									
3											
4		*Regression Statistics*									
5		Multiple R	0.191968828								
6		R Square	0.036852031								
7		Adjusted R Square	0.034547849								
8		Standard Error	18.72132871								
9		Observations	420								
10											
11		ANOVA									
12			*df*	*SS*	*MS*	*F*	*Significance F*				
13		Regression	1	5605.547425	5605.547425	15.99354341	7.5154E-05				
14		Residual	418	146504.0462	350.4881488						
15		Total	419	152109.5936							
16											
17			*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*	
18		Intercept	649.978849	1.387717212	468.3799001	0	647.2510751	652.7066229	647.2510751	652.7066229	
19		STR<20	7.372410149	1.843474529	3.999192845	7.5154E-05	3.748774368	10.99604593	3.748774368	10.99604593	
20											
21											
22											
23											
24											

Is the difference in the population mean test scores in the two groups statistically significantly different from zero at the 5% level?

$|t - Stat| > 1.96$; **Reject Ho: *population mean test scores in the two groups are statistically significantly different from zero at 5% significance level.***

95% CI: $7.37 \pm 1.96 \times 1.8$

This CI excludes $\beta_0 = 0$. $\Rightarrow$ Reject the hypothesis that $\beta_1 = 0$ at 5% significance level.

binary X regression | binary X | bell curve | caschool | Figure 4.2 | linear_model | Table4.1 | 99% | Prediction | outliers

190%

Exercises

E5.1 Use the data set Earnings_and_Height described in Empirical Exercise 4.2 to carry out the following exercises.

a. Run a regression of Earnings on Height.

i. Is the estimated slope statistically significant?

ii. Construct a 95% confidence interval for the slope coefficient.

b. Repeat (a) for women.

c. Repeat (a) for men.

d. Test the null hypothesis that the effect of height on earnings is the same for men and women. (Hint: See Exercise 5.15.)

e. One explanation for the effect on height on earnings is that some professions require strength, which is correlated with height. Does the effect of height on earnings disappear when the sample is restricted to occupations in which strength is unlikely to be important?

Using the data set **Growth** described in Empirical Exercise 4.1, but excluding the data for Malta, run a regression of *Growth* on *TradeShare*.

a. Is the estimated regression slope statistically significant? This is, can you reject the null hypothesis H_0: $b_1 = 0$ vs. a two-sided alternative hypothesis at the 10%, 5%, or 1% significance level?

b. What is the *p*-value associated with the coefficient's *t*-statistic?

c. Construct a 90% confidence interval for b1.

On the text website, **www.pearsonglobaleditions.com/Stock_Watson**, you will find the data file **Birthweight_Smoking**, which contains data for a random sample of babies born in Pennsylvania in 1989. The data include the baby's birth weight together with various characteristics of the mother, including whether she smoked during the pregnancy. A detailed description is given in **Birthweight_Smoking_Description**, also available on the website. In this exercise you will investigate the relationship between birth weight and smoking during pregnancy.

a. In the sample:

i. What is the average value of *Birthweight* for all mothers?

ii. For mothers who smoke?

iii. For mothers who do not smoke?

b. i. Use the data in the sample to estimate the difference in average birth weight for smoking and nonsmoking mothers.

ii. What is the standard error for the estimated difference in (i)?

iii. Construct a 95% confidence interval for the difference in the average birth weight for smoking and nonsmoking mothers.

c. Run a regression of *Birthweight* on the binary variable *Smoker*.

i. Explain how the estimated slope and intercept are related to your answers in parts (a) and (b).

ii. Explain how the $SE(\widehat{\beta_1})$ is related to your answer in b(ii).

iii. Construct a 95% confidence interval for the effect of smoking on birth weight.

d. Do you think smoking is uncorrelated with other factors that cause low birth weight? That is, do you think that the regression error term, say *ui*, has a conditional mean of zero, given *Smoking* (*Xi*)? (You will investigate this further in *Birthweight* and *Smoking* exercises in later chapters.)