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Logistic Regression using OLS1C in Excel 2013

by
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Director, W. M. Keck Statistical Literacy Project

Slides, output and data at: www.StatLit.org/
pdf/2015-Schield-Logistic-OLS1C-Excel2013-Slides.pdf
pdf/2015-Schield-Logistic-OLS1C-Excel2013-Demo.pdf
Excel/2015-Schield-Logistic-OLS1C-Excel2013-Data.xlsx

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Background & Goals

Modelling a binary outcome (loan vs. no-loan) requires logistic regression to avoid meaningless predictions.

Doing an exact logistic regression in Excel requires Solver and involves many steps. For details, see www.statlit.org/pdf/Excel2013-Schield-Logistic-MLE1A-Slides.pdf

This presentation uses an approximation: OLS1. By slightly adjusting the binary outcomes, one can use OLS regression to solve for a good logistic model.

Assignment: Create the logistic model (slide 9) and the logistic graph (slide 12).

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This demo uses Weight (col A) to predict Gender (col B)

Column B: 0=Female, 1 = Male (circled)

A	B	C
Weight	Male	Male1
95	0	
102	0	
108	0	
108	0	
110	0	
110	0	
112	0	
115	0	
115	0	
116	0	
116	0	

Data in rows 7 to 98

121	0
122	0
123	(1)
125	0
125	0
125	0
125	0
125	0
130	0
130	(1)
130	0
130	0

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1) Nudge Binary Male to Eliminate Zero and One

	A	B	C	D	E
1					
2	Predict chance of being male given weight.				
3	C7	=IF(B7=0, 0.001, 0.999)			
4					
5	A	B	C	D	E
6	Weight	Male	Male1	Odds	LN(Odds) yP
7	95	0	0.001		
8	102	0			

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2) Enter formula for Odds in D7; LN[Odds(p)] in E7

	A	B	C	D	E	F	G
1							
2	Predict chance of being male (1) given weight. Reg						
3	C7	=IF(B7=0, 0.001, 0.999)			E7	=LN(D7)	
4	D7	=C7/(1-C7)					
5	A	B	C	D	E	F	
6	Weight	Male	Male1	Odds	LN(Odds)	yPred	6
7	95	0	0.001	0.001	-6.91		7
8	102	0					8

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3) Select C7:E7 Drag to bottom of data: Row 98

A	B	C	D	E	F	G
Predict chance of being male given weight. Regres						
C7	=IF(B7=0, 0.001, 0.999)			E7	=LN(D7)	
D7	=C7/(1-C7)					
A	B	C	D	E	F	
Weight	Male	Male1	Odds	LN(Odds)	yPred	6
95	0	0.001	0.001	-6.91		7
102	0					8
108	0					9

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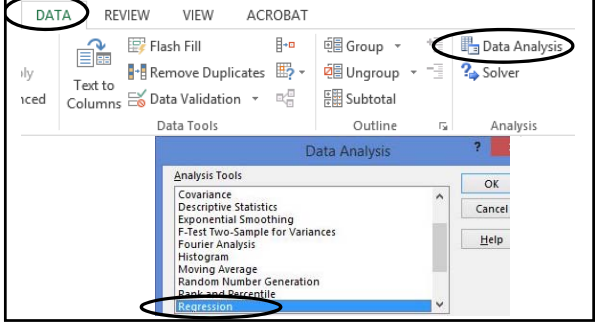
A) From Data Bar, Select Data Analysis; Regression



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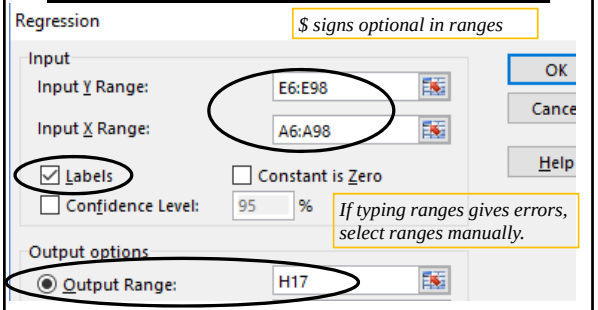
B) Select Data, Labels, Output Range. Press OK



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C) Logistic Regression: Results Using OLS1

19	*Regression Statistics*					
20	Multiple R	0.708667				
21	R Square	0.5022089				
22	Adjusted R Square	0.4966779				
23	Standard Error	4.7839195				
24	Observations	92				
25						
26	ANOVA					
27		*df*	*SS*	*MS*	*F*	*ignificance F*
28	Regression	1	2078.01	2078.01	90.79874	2.73E-15
29	Residual	90	2059.73	22.88589		
30	Total	91	4137.739			
31						
32		*Coefficients*	*ndard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
33	Intercept	-27.56682	3.106615	-8.87359	6.31E-14	-33.7387	-21.395
34	Weight	0.2012952	0.021125	9.528837	2.73E-15	0.159327	0.24326

Check to see that you get the same results.

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D) Generate F7; Pull F7 down to F98

C	D	E	F	G
e of being male given weight. Regress using				
=0, 0.001, 0.999)			E7	=LN(D7)
-C7)			F7	=1/(1+EXP(-I$33-I$34*A7))

C	D	E	F	
Male1	Odds	LN(Odds)	yPred	6
0.001	0.001	-6.91	0.000	7

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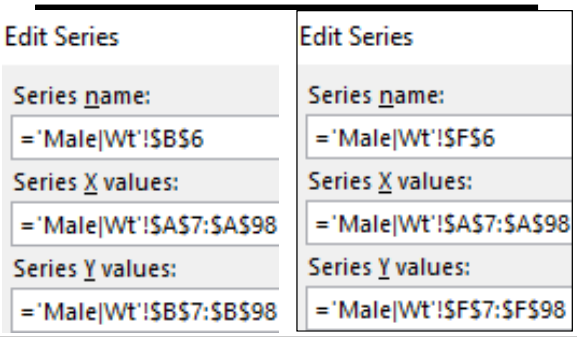
E) Insert XY-Plot. Add Two Series: Male vs Weight; yPred vs Weight



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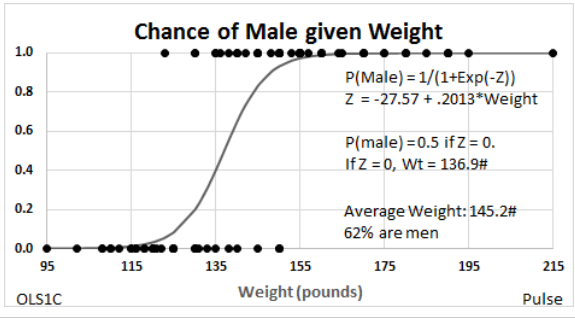
F) Add Titles and Textboxes. Format yPred with Solid Line



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116	0	
116	0	

Data in rows 7 to 98

121	0
122	0
123	1
125	0
125	0
125	0
125	0
125	0
130	0
130	1
130	0
130	0

1) Nudge Binary Male to Eliminate Zero and One

	A	B	C	D	E
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6		Weight	Male	Male1	Odds	LN(Odds)	yPred
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3) Select C7:E7
Drag to bottom of data: Row 98

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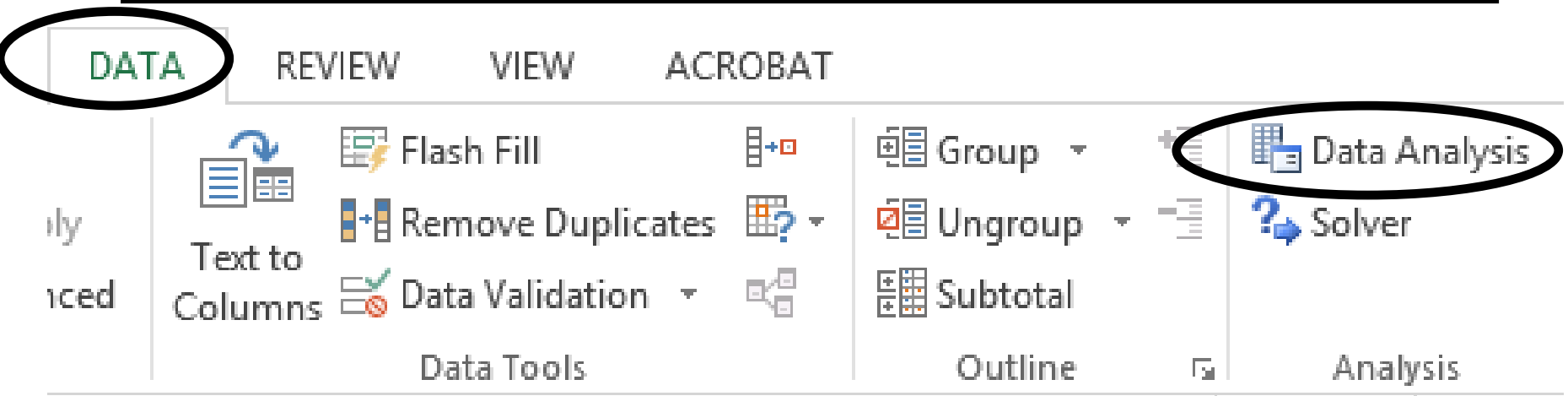
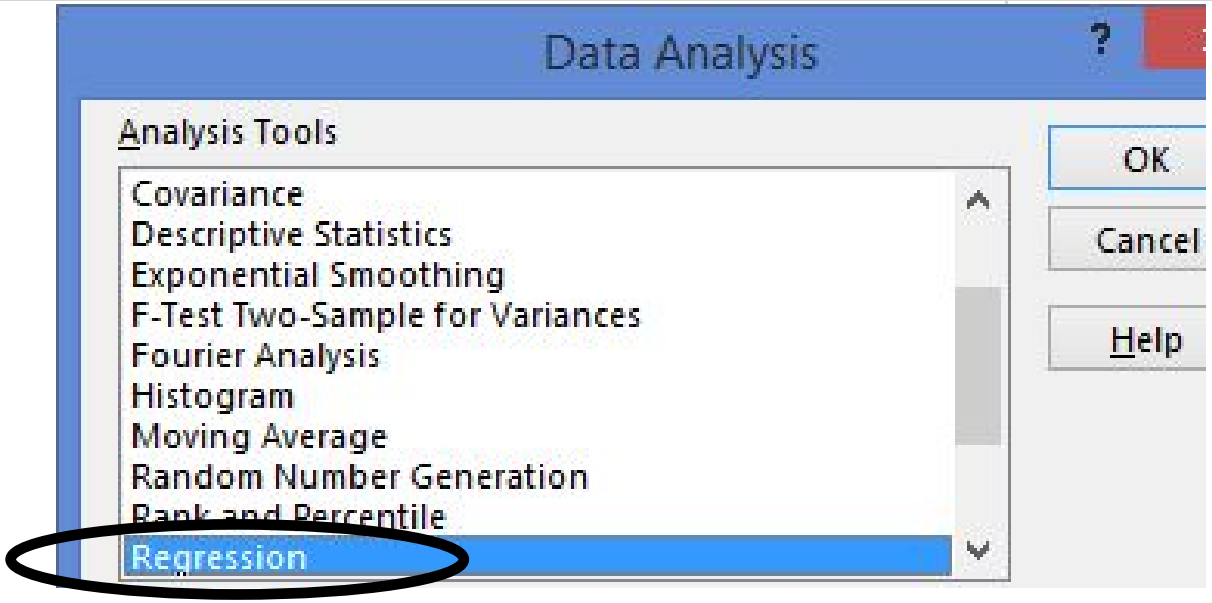
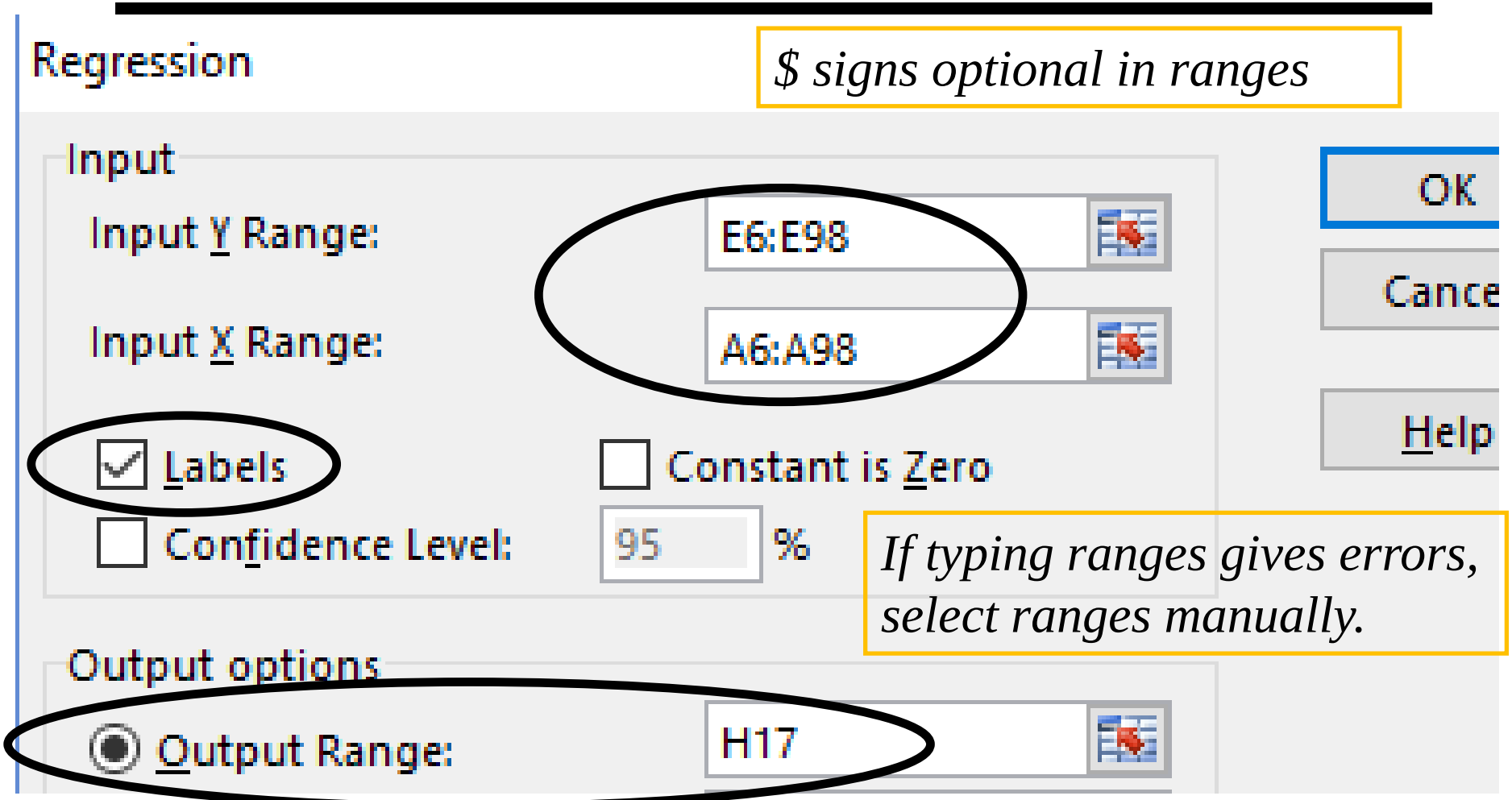




B) Select Data, Labels, Output Range. Press OK



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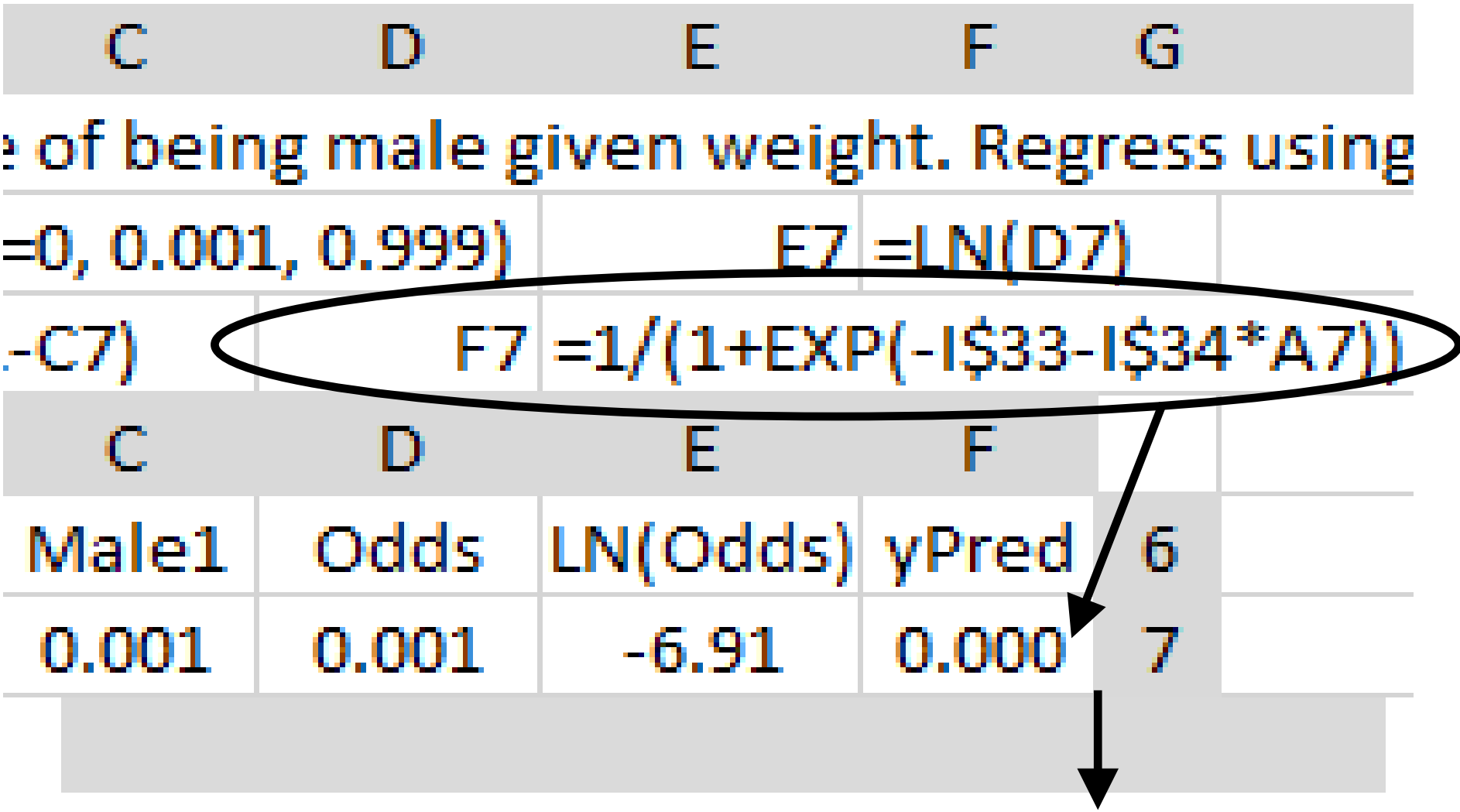


E) Insert XY-Plot. Add Two Series: Male vs Weight; yPred vs Weight

Edit Series

Series name:

='Male|Wt'!$B$6

Series X values:

='Male|Wt'!$A$7:$A$98

Series Y values:

='Male|Wt'!$B$7:$B$98

Edit Series

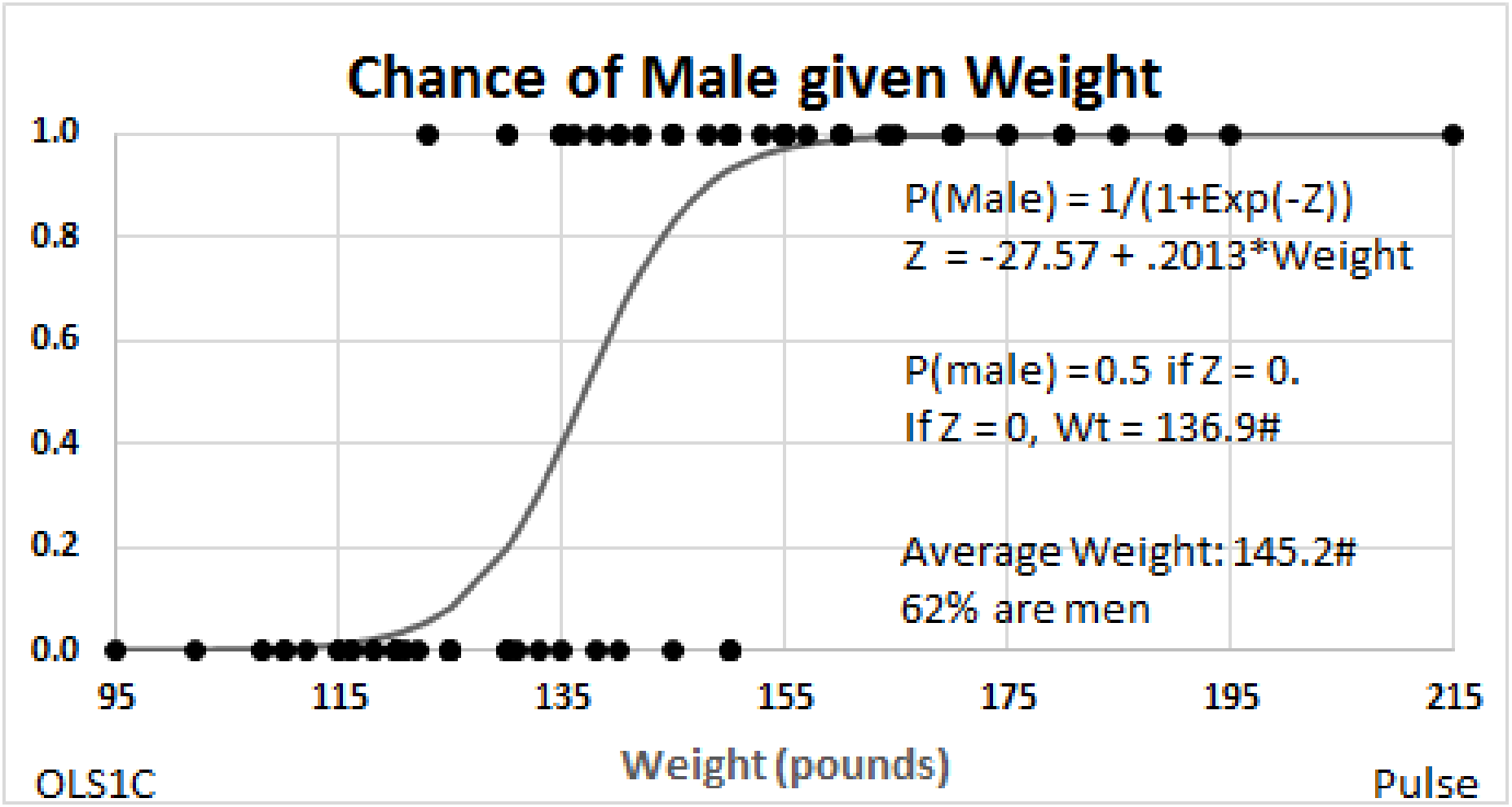
Series name:

='Male|Wt'!$F$6

Series X values:

='Male|Wt'!$A$7:$A$98

Series Y values:

='Male|Wt'!$F$7:$F$98

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