

# How do you interpret P-values in regression output?

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## RECOMMENDED CITATION

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P-values are statistical measures that indicate the probability of obtaining the observed results of a regression analysis, assuming that the null hypothesis is true. In other words, they reflect the likelihood of the relationship between the independent and dependent variables being due to chance. A small P-value (typically less than 0.05) suggests that the observed relationship is statistically significant and not due to chance, while a large P-value indicates that the relationship is not significant and could be attributed to random variation. Therefore, when interpreting P-values in regression output, it is important to consider their significance in determining the strength and validity of the relationship between variables.

## **Excel: Interpret P-Values in Regression Output**

**Multiple linear regression is used to quantify the relationship between two or more predictor variables and a .**

**Whenever we perform multiple linear regression, we're always interested in the p-values in the output to determine if the relationship between the predictor variables and the response variable is statistically significant.**

**This tutorial explains how to interpret the p-values in the output of a multiple linear regression model in Excel.**

### **Example: Interpreting P-values in Regression Output in Excel**

**Suppose we want to know if the number of hours spent studying and the number of prep exams taken affects**

the score that a student receives on a certain college entrance exam.

To explore this relationship, we can perform multiple linear regression using hours studied and prep exams taken as predictor variables and exam score as a response variable.

The following screenshot shows the regression output of this model in Excel:

D	E	F	G	H	I	J	K
SUMMARY OUTPUT							
<i>Regression Statistics</i>							
Multiple R	0.857						
R Square	0.734						
Adjusted R Square	0.703						
Standard Error	5.366						
Observations	20						
<i>ANOVA</i>							
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>		
Regression	2	1350.76	675.38	23.46	0.00		
Residual	17	489.44	28.79				
Total	19	1840.20					
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	
Intercept	67.67	2.82	24.03	0.00	61.73	73.61	
hours	5.56	0.90	6.18	0.00	3.66	7.45	
prep_exams	-0.60	0.91	-0.66	0.52	-2.53	1.33	

There are three p-values that we should look at in the

**output:**

**P-value of the overall model**  
**P-value of the first predictor variable (hours)**  
**P-value of the second predictor variable (prep exams)**

**Here is how to interpret each p-value:**

**P-Value of the Overall Model**

**The p-value of the overall model can be found under the column called Significance F in the output.**

**We can see that this p-value is 0.00.**

**Since this value is less than .05, we can conclude that the regression model as a whole is statistically significant.**

**In other words, the combination of hours studied and prep exams taken has a statistically significant relationship with final exam score.**

**P-value of the first predictor variable (hours)**

**Since this value is less than .05, we can conclude that hours studied is statistically significant.**

**In other words, the number of hours that a student studies has a statistically significant relationship with the final exam score that a student receives.**

**P-value of the second predictor variable (prep exams)**

**The p-value for the second predictor variable, prep exams , is 0.52.**

**Since this value is not less than .05, we can conclude that number of prep exams taken is not statistically significant.**

**In other words, the number of prep exams that a student takes does not have a statistically significant relationship with the final exam score that a student receives.**

**Since this variable is not statistically significant, we may decide to remove it from the model because it doesn't add any significant improvement to the overall model.**

**In this case, we could perform simple linear regression using only hours studied as the predictor variable.**

**The following tutorials explain how to perform other common tasks in Excel:**

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