

What is the meaning of significance codes in R?

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April 23, 2024

RECOMMENDED CITATION

stats writer (2024). *What is the meaning of significance codes in R?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=138299>

Significance codes in R are a way to measure the level of significance of a statistical analysis result. These codes are represented by asterisks (*) and indicate the level of confidence in the results, with a higher number of asterisks representing a higher level of significance. They are commonly used in regression analysis to determine the importance of a variable in predicting the outcome. The codes are based on p-values, with smaller p-values indicating a higher level of significance. Overall, significance codes provide a standardized way to interpret the statistical significance of results in R, allowing researchers to make informed decisions based on their analysis.

Interpret Significance Codes in R

When you perform regression analysis or ANOVA in R, the output tables will contain p-values for the variables used in the analysis along with corresponding significance codes.

These significance codes are displayed as a series of stars or a decimal point if the variables are statistically significant.

Here is how to interpret the various significance codes:

significance code p-value

**** (0.001, 0.01]**

*** (0.01, 0.05]**

. (0.05, 0.1]

(0.1, 1]

The following examples show how to interpret these significance codes in practice.

Example: Significance Codes in Regression

The following code shows how to fit a multiple linear regression model with the built-in `mtcars` dataset using `hp`, `drat`, and `wt` as predictor variables and `mpg` as the response variable:

```
#fit regression model using hp, drat, and wt as predictors
```

```
model <- lm(mpg ~ hp + drat + wt, data = mtcars)
```

```
#view model summary  
summary(model)
```

Call:

```
lm(formula = mpg ~ hp + drat + wt, data = mtcars)
```

Residuals:

```
Min 1Q Median 3Q Max
```

```
-3.3598 -1.8374 -0.5099 0.9681 5.7078
```

Coefficients:

```
Estimate Std. Error t value Pr(>|t|)
```

```
(Intercept) 29.394934 6.156303 4.775 5.13e-05 ***
hp -0.032230 0.008925 -3.611 0.001178 **
drat 1.615049 1.226983 1.316 0.198755
wt -3.227954 0.796398 -4.053 0.000364 ***
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.561 on 28 degrees of freedom

Multiple R-squared: 0.8369, Adjusted R-squared: 0.8194

F-statistic: 47.88 on 3 and 28 DF, p-value: 3.768e-11

Here is how to interpret the significance codes for the three predictor variables:

hp has a p-value of .001178. Since this value is in the range (0.001, 0.01], it has a significance code of **. *drat* has a p-value of .198755. Since this value is in the range (0.1, 1], it has no significance code. *wt* has a p-value of .000364. Since this value is in the range , it has a significance code of ***

If we used an alpha level of $\alpha = .05$ to determine which predictors were significant in this regression model, we'd say that *hp* and *wt* are statistically significant

predictors while *drat* is not.

Example: Significance Codes in ANOVA

The following code shows how to fit a one-way ANOVA model with the built-in *mtcars* dataset using *gear* as the factor variable and *mpg* as the response variable:

```
#fit one-way ANOVA
```

```
model <- aov(mpg ~ gear, data = mtcars)
```

```
#view the model output
```

```
summary(model)
```

```
Df Sum Sq Mean Sq F value Pr(>F)
```

```
gear 1 259.7 259.75 8.995 0.0054 **
```

```
Residuals 30 866.3 28.88
```

```
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Here is how to interpret the significance code in the output:

gear has a p-value of .0054. Since this value is in the range (0.001, 0.01], it has a significance code of **

Using an alpha level of $\alpha = .05$, we would say that *gear* is statistically significant. In other words, there is a statistically significant difference between the mean mpg of cars based on their value for *gear*.

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