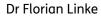
PO91Q - Fundamentals in Quantitative Research Methods

Formula Collection and Notation



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1 | Formulae

Statistic	Formula	
Descriptives		
Deviation	$d = y_i - \bar{y}$	
Mean	$\bar{y} = \frac{\sum y_i}{n}$	
	$\mu = \sum y P(y) = E[y]$	
Range	$y_{\text{range}} = y_{\text{max}} - y_{\text{min}}$	
Standard Deviation	$s = \sqrt{\frac{\sum (y_i - \bar{y})^2}{n - 1}}$	
Inference		
Confidence Interval	$Pr(\bar{y} - t_{\alpha/2} \cdot se \le \mu \le \bar{y} + t_{\alpha/2} \cdot se) = 1 - \alpha$	
Standard Error	$\sigma_{\bar{y}} = \frac{\sigma}{\sqrt{n}}$	
	$se = \frac{s}{\sqrt{s}}$	
t-test	$t = \frac{\sqrt{y} - \mu_0}{\sqrt{y} - \mu_0}$	
Variance	$s^2 = \frac{\sum_{i=1}^{8} (y_i - \bar{y})^2}{1}$	
z-score	$\sigma_{\bar{y}} = \frac{\sigma}{\sqrt{n}}$ $se = \frac{s}{\sqrt{n}}$ $t = \frac{\bar{y} - \mu_0}{se}$ $s^2 = \frac{\sum (y_i - \bar{y})^2}{n^2 - 1}$ $z = \frac{y - \mu}{\sigma}$	
Crosstabulations		
χ^2 -Test Statistic	$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$	

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Statistic	Formula
Correlation	
Pearson's Correlation	$r_p = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$
Regression	• • • • • • • • • • • • • • • • • • • •
Adjusted R ²	$\bar{R}^2 = 1 - \frac{\sum \hat{\epsilon}_i^2 / (n - k - 1)}{\sum (y_i - \bar{y})^2 / (n - 1)}$
Coefficient of Determination	$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS} = 1 - \frac{\sum \hat{\epsilon}_i^2}{\sum (y_i - \bar{y})^2}$
Estimated Variance	$\hat{\sigma}^2 = \frac{\sum \hat{\epsilon}_i^2}{n - p}$
Estimator of $oldsymbol{eta}_0$	$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$
Estimator of $oldsymbol{eta}_1$	$\hat{\beta}_1 = \frac{\sum_{i=1}^{N} (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{N} (x_i - \bar{x})^2}$
Explained Sum of Squares	$\sum (\hat{y}_i - \bar{y})^2$
Residual Sum of Squares	$\sum \hat{\epsilon}_i^2 = \sum (y_i - \hat{y}_i)^2$
Standard Error of $oldsymbol{eta}_0$	$se(\hat{\beta}_0) = \sqrt{\frac{\sum x_i^2}{n\sum (x_i - \bar{x})^2}} \sigma$ $se(\hat{\beta}_1) = \frac{\sigma}{\sqrt{\sum (x_i - \bar{x})^2}}$
Standard Error of $oldsymbol{eta}_1$	$se(\hat{\beta}_1) = \frac{\sigma}{\sqrt{\sum (x_i - \bar{x})^2}}$
Total Sum of Squares	$\sum (y_i - \bar{y})^2$

Table 2: Formulae for PO91Q

2 | Notation

Symbol	Explanation
Descriptives	
d	Deviation
n	Sample Size
S	Standard Deviation
s^2	Variance
ÿ	Mean
Уi	Observation i
f	(Absolute) Frequency
cf	Cumulative (Absolute) Frequency
rf	Relative Frequency
crf	Cumulative Relative Frequency
Inference	
E[x]	The expected value of x
μ	Mean of the Population
se	Standard Error (with s of sample)
σ	Standard Deviation of the Population
$\sigma_{ar{y}}$	Standard Error (with σ of population)
t	t-value
Z	z-value
Bivariate Method	ds
χ^2	Chi-Squared for test of independence
r	Correlation Coefficient
r_p	Pearson's Product-Moment Correlation Coefficient
se ₀	Standard Error under the Null Hypothesis
Regression	
β	Regression Coefficient
β	Estimated Regression Coefficient
ϵ	Error Term
$\hat{\epsilon}$	Estimated Error Term / Residual
R^2	R-Squared / Model Fit
σ^2	Mean Squared Error
р	Total Number of Regression Coefficients, including the Intercept
k	Number of Slope Coefficients
${ar{\sf R}}^2$	Adjusted R-Squared
log(x)	Logarithm of variable x

Table 3: Notation