

General Linear Test – Summary

Here are the details for the general linear test of

H_0 : Reduced Model is sufficient

H_a : Full Model is needed

	General	Section 2.8 Test for $\beta_1 = 0$	Section 3.7 Lack of fit test c = number of different X values in sample n_j = number of Y values at X_j Y_{ij} = i^{th} value of Y at X_j
Full Model	Varies	$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$	$Y_{ij} = \mu_j + \varepsilon_{ij}$
Reduced Model	Varies	$Y_i = \beta_0 + \varepsilon_i$	$Y_{ij} = \beta_0 + \beta_1 X_j + \varepsilon_{ij}$
Degrees of freedom (full) = df_F	$n - \#$ of parameters estimated in full model	$n - 2$ (2 parameters are estimated)	$n - c$ (c different means estimated)
Degrees of freedom (reduced) = df_R	$n - \#$ of parameters estimated in reduced model	$n - 1$ (1 parameter is estimated)	$n - 2$ (2 parameters are estimated)
SSE(F)	$\sum_{i=1}^n (Y_i - \hat{Y}_i)^2$ where $\hat{Y}_i$ is the predicted value using the full model	Usual SSE for simple linear regression	SSPE = Pure error sum of squares $= \sum_{j=1}^c \sum_{i=1}^{n_j} (Y_{ij} - \bar{Y}_j)^2$
SSE(R)	$\sum_{i=1}^n (Y_i - \hat{Y}_i)^2$ where $\hat{Y}_i$ is the predicted value using the reduced model	Usual SSTO for simple linear regression	Usual SSE for simple linear regression
Numerator of test statistic F^*	$[SSE(R) - SSE(F)] / (df_R - df_F)$	[Usual SSR]/1	SSLF/(c - 2) where SSLF = Lack of fit sum of squares = Usual SSE - SSPE
Denominator of test statistic F^*	$SSE(F) / df_F$	Usual MSE for simple linear regression	SSPE/(n - c)
Degrees of freedom for F^*	$[(df_R - df_F), df_F]$	$[1, n - 2]$	$[c - 2, n - c]$