Summary of inference tests in MLR

H_0, H_A	F test and distribution under the null	t test	SAS PROC REG

OVERALL TEST

H_0: $\beta_1 = \ldots = \beta_k = 0$
H_A: At least one of $\beta_1, \ldots, \beta_k \neq 0$

Standard output in the ANOVA table.

OR

$$F = \frac{\text{MSR(full)}}{\text{MSE(full)}} \sim F_{\text{k, n-k-1}}$$

none

H_0: $Y = \beta_0 + \varepsilon$ is the better model

one-sided upper tail test

H_A: $Y = \beta_0 + \beta_1 X_1 + \ldots + \beta_k X_k + \varepsilon$ is the better model

PARTIAL *F* TEST (*Example demonstrating a test of the contribution of X_1.)*

H_0: $\beta_l = 0$ (All other βs $\neq 0$)
H_A: $\beta_l \neq 0$ (All other βs $\neq 0$)

1. F test provided using **`test`** statement.

OR

$$F = \frac{\left(\text{SSR(full)} - \text{SSR(reduced)}\right)/1}{\text{MSE(full)}}$$

$$t = \frac{\hat{\beta}_1}{SE(\hat{\beta}_1)} \sim t_{\text{n-k-1}}$$

2. ***t* test is standard output**.

H_0: $Y = \beta_0 + \beta_2 X_2 + \ldots + \beta_k X_k + \varepsilon$ is the better model

$F \sim F_{1, \text{n-k-1}}$
one sided upper tail test

Two-sided test

H_A: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + \varepsilon$ is the better model

H_0, H_A	F test and distribution under the null	t test	SAS PROC REG

MULTIPLE PARTIAL *F* TEST

(*Example demonstrating a test of the contribution of X_1 and X_2. Here the number of variables being tested is 2.)*

H_0: $\beta_1 = \beta_2 = 0$ (All other βs $\neq 0$)
H_A: At least one of β_1, $\beta_2 \neq 0$
(All other βs $\neq 0$)

1. ***F* test provided using `test` statement**.

OR

$$F = \frac{\dfrac{\text{SSR(full)-SSR(reduced)}}{\left(\text{\# vars tested}\right)}}{\text{MSE(full)}}$$

none

H_0: $Y = \beta_0 + \beta_3 X_3 + \ldots + \beta_k X_k + \varepsilon$ is the better model

$F \sim F_{\text{\# vars tested, n-k-1}}$
one sided upper tail test

H_A: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots + \beta_k X_k + \varepsilon$ is the better model