Formula Sheet

$$Q(\beta) = (\mathbf{Y} - \mathbf{X}\beta)'(\mathbf{Y} - \mathbf{X}\beta)$$

$$\mathbf{b} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{Y}$$

$$\hat{\mathbf{Y}} = \mathbf{X}\mathbf{b} = \hat{\mathbf{H}}\mathbf{Y}$$

$$\hat{\mathbf{H}} = \mathbf{X}(\mathbf{X}'\mathbf{X})^{-\mathbf{1}}\mathbf{X}'$$

$$\mathbf{e} = \mathbf{Y} - \hat{\mathbf{Y}} = \mathbf{Y} - \mathbf{X}\mathbf{b}$$

$$= \mathbf{I} - \mathbf{H}\mathbf{Y}$$

$$\sigma^2(\mathbf{e}) = \sigma^2(\mathbf{I} - \mathbf{H})$$

$$s^2(\mathbf{e}) = MSE(\mathbf{I} - \mathbf{H})$$

$SSR = \mathbf{b}'\mathbf{X}'\mathbf{Y} - \frac{1}{n}\mathbf{Y}'\mathbf{J}\mathbf{Y}$
$SSE = \mathbf{Y}'\mathbf{Y} - \mathbf{b}'\mathbf{X}'\mathbf{Y}$
$SSTO = \mathbf{Y}'\mathbf{Y} - \mathbf{Y}'\mathbf{J}\mathbf{Y}$

$$F^* = MSR/MSE$$

$$\sigma^2(\mathbf{b}) = \sigma^2(\mathbf{X}'\mathbf{X})^{-1}$$

$$s^2(\mathbf{b}) = MSE(\mathbf{X}'\mathbf{X})^{-1}$$

$$R_a^2 = 1 - \frac{SSE/(n-p)}{SSTO/(n-1)}$$

$$r = \sqrt{R^2}$$

$$(b_k - t(1 - \frac{\alpha}{2}; n-p)s(b_k); b_k + t(1 - \frac{\alpha}{2}; n-p)s(b_k))$$

$$t^* = \frac{b_k}{s(b_k)}$$

$$(b_k - t(1 - \frac{\alpha}{2l}; n-p)s(b_k); b_k + t(1 - \frac{\alpha}{2l}; n-p)s(b_k))$$

$$(Y_h - t(1 - \frac{\alpha}{2}; n-p)s(\hat{Y}_h); Y_h + t(1 - \frac{\alpha}{2}; n-p)s(\hat{Y}_h))$$

$$s^2(\hat{Y}_h) = MSE(\mathbf{X}_h'(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}_h)$$

$$(Y_h - t(1 - \frac{\alpha}{2}; n-p)s(\hat{Y}_h); Y_h + t(1 - \frac{\alpha}{2}; n-p)s(\hat{Y}_h))$$

$$s^2(pred) = MSE(1 + \mathbf{X}_h'(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}_h)$$

$$(Y_h - t(1 - \frac{\alpha}{2}; n - p)s(\hat{Y}_h); Y_h + t(1 - \frac{\alpha}{2}; n - p)s(\hat{Y}_h))$$

$$s^2(predmean) = MSE(\mathbf{X}_h'(1/m + \mathbf{X}'\mathbf{X})^{-1}\mathbf{X}_h)$$