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**Exercise D9.1** Using a calculator or a computer program that conveniently performs matrix computations, and working with regression that you performed in Exercise D5.5:1

(a) Compute the least-squares regression coefficients, \( \mathbf{b} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y} \).

(b) Verify that the least-squares slope coefficients \( \mathbf{b}_1 = [B_1, B_2, \ldots, B_k]' \) can be computed as \( \mathbf{b}_1 = (\mathbf{X}'^*\mathbf{X}^*)^{-1}\mathbf{X}'^*\mathbf{y}^* \) where \( \mathbf{X}^* \) and \( \mathbf{y}^* \) contain mean deviations for the \( X \)'s and \( Y \), respectively.

**Exercise D9.2** Using a calculator or a computer program that performs matrix computations, and working with the Canadian occupational prestige data (continuing Exercise D9.1):

(a) Calculate the estimated error variance, \( S_E^2 = \mathbf{e}'\mathbf{e}/(n - k - 1) \) (where \( \mathbf{e} = \mathbf{y} - \mathbf{X}\mathbf{b} \)), and the estimated covariance matrix of the coefficients, \( \mathbf{V}(\mathbf{b}) = S_E^2(\mathbf{X}'\mathbf{X})^{-1} \).

(b) Verify that the estimated covariance matrix for the slope coefficients \( \mathbf{b}_1 = [B_1, B_2, \ldots, B_k]' \) in this regression can be calculated as \( \mathbf{V}(\mathbf{b}_1) = S_E^2(\mathbf{X}'^*\mathbf{X}^*)^{-1} \), where \( \mathbf{X}^* \) is the mean-deviation matrix for the \( X \)'s.

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1 Many computer programs (for example, APL, Gauss, Lisp-Stat, Mathematica, R, S-PLUS, SAS/IML, and Stata) include convenient facilities for matrix calculations.