

Using R performs matrix computations, work with regression on the States Data. Take the States Data . Use the teacherpay as the Response variable and the Sat Math and Percentage as the Explanatory variable.

- (a) Compute the least-squares regression coefficients, $\mathbf{b} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}$.
- (b) Calculate the estimated error variance, $s_e^2 = \mathbf{e}'\mathbf{e}/(k - n - 1)$ (where $\mathbf{e} = \mathbf{y} - \mathbf{X}\mathbf{b}$), and the estimated covariance matrix of the coefficients, $V(\mathbf{b}) = s_e^2(\mathbf{X}'\mathbf{X})^{-1}$.
- (c) Calculate the coefficient Standard Error for this model
- (d) Verify that the `lm()` model provides us with the same t and pvalues as the matrix formulation.
- (e) Create a 3d vector geometric representation for this data.

C_t	
P_t	
$W_t^{(p)}$	
I_t	Investment
K_{t-1}	Capital stock (lagged 1 year)
X_t	Equilibrium demand
$W_t^{(g)}$	Government wages
G_t	Government non-wage spending
T_t	Indirect business taxes and net exports

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

²L. Klein, *Econometric Fluctuations in the United States, 1921-1941* (Wiley, 1950); W. H. Greene, *Econometric Analysis, Second Edition* (Macmillan, 1993).