Some More Matrix and Statistical Results

Definition: If $\mathbf{y}$ is a vector random variable of length n with mean vector $E(\mathbf{y}) = \mu$, covariance matrix $V(\mathbf{y}) = \mathbf{\Sigma}$,and has a probability density function of:

$$f(\mathbf{y}) = |2\pi\mathbf{\Sigma}|^{-1/2}\exp\{-\frac{1}{2}(\mathbf{y}-\boldsymbol{\mu})'\mathbf{\Sigma}^{-1}(\mathbf{y}-\boldsymbol{\mu})\},$$

then $\mathbf{y}$ has a multivariate normal distribution, denoted by $\mathbf{y} \sim N_n(\boldsymbol{\mu}, \mathbf{\Sigma})$.

Note that this is a slightly more general version than shown on page 197 of the text, since here $V(\mathbf{y}) = \mathbf{\Sigma}$ whereas on that page they assume $V(\mathbf{y}) = \sigma_\varepsilon^2\mathbf{I}_n$.

Result 3: Let $\mathbf{y} \sim N_n(\boldsymbol{\mu}, \mathbf{\Sigma})$, let $\mathbf{C}$ be an m **x** n matrix, and $\mathbf{d}$ be an m **x** 1 vector. Then $\mathbf{Cy}+ \mathbf{d} \sim N_m(\mathbf{C}\boldsymbol{\mu}+\mathbf{d}, \mathbf{C\Sigma C}')$.

References

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Sen, A., and Srivastava, M. 1990. Regression Analysis: Theory, Methods, and Applications, New York: Springer-Verlag, Inc.