



My favorite matrix "trick".

Demmi

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Let  $x$  be an elliptically  
contoured random variable  
with  $x \in \Omega_x \subset \mathbb{R}^p$

$$E(x) = \mu$$

$$\text{and } \text{Var}(x) = \Sigma$$

Let  $\eta$  be a  $p \times k$  matrix.

Then

$$E(x | \eta^T x) - \mu = P_{\eta(\Sigma)}^T (x - \mu)$$

where  $P_{\eta(\Sigma)}$  is the orthogonal

projection operator for Column space  
of  $\eta$  relative to the inner product  
induced by  $\Sigma$ . (Cook, 1992)