Standardizing the Sample Principal Components

- Principal components are generally affected by the changes in scale.
- Variables measured on different scales or on a common scale with widely differing ranges are often standardized.
- The sample principal components of the standardized observations are given by replacing the matrix **S** on page 70 with **R** and replacing $x_1, \ldots, x_p$ with standardized observations $z_1, \ldots, z_p$.
- Note the total standardized sample variance=tr(**R**)=p.
- Example 8.5 of J&W

Unusually Small Eigenvalue

- An unusually small value for the last eigenvalue from either the sample covariance or correlation matrix can indicate an unnoticed linear dependency in the data set.
- If this occurs, one (or more) of the variables is redundant (e.g., total or average scores) and should be deleted.