

$$\underline{Y}_1 = \frac{1}{\sqrt{n}} (1 \ 1 \ \dots \ 1) \begin{pmatrix} z_1 \\ \vdots \\ z_n \end{pmatrix}$$

$$\frac{z_1 + \dots + z_n}{\sqrt{n}} = \frac{n \bar{z}_n}{\sqrt{n}}$$

$$\underline{Y}_1^2 = \left( \frac{n \bar{z}_n}{\sqrt{n}} \right)^2 = \frac{n^3}{n} \bar{z}_n^2 = n \bar{z}_n^2$$