$$t=\frac{X-\mathbb{E}(X)_0}{SE\left[\mathbb{E}(X)_0\right]}\Rightarrow t=\frac{r\sqrt{n-2}}{\sqrt{1-r^2}}=\frac{r}{\left(\frac{\sqrt{1-r^2}}{\sqrt{n-2}}\right)}\Rightarrow r_Z\sim N\left(0,\sqrt{\frac{1-r^2}{n-2}}\right)\ when\ H_0:\ \rho=0$$

$$However,\ when\ H_0\ :\rho=\rho_0\ and\ \rho_0\neq 0\ \Rightarrow r_Z\sim N\left(\rho_{0Z},\sqrt{\frac{1}{n-3}}\right)$$

$$y_i=\beta_0+\beta_1X_{1i}+\beta_2X_{2i}+\ldots+\beta_pX_{pi}+\varepsilon_i;\quad i=1,\ldots,n$$

$$\begin{pmatrix}y_1\\y_2\\\vdots\\y_n\end{pmatrix}=\begin{bmatrix}\beta_0+\beta_1X_{11}+\beta_2X_{21}+\ldots+\beta_pX_{p1}+\varepsilon_1\\\beta_0+\beta_1X_{12}+\beta_2X_{22}+\ldots+\beta_pX_{p2}+\varepsilon_2\\\vdots\\\beta_0+\beta_1X_{1n}+\beta_2X_{2n}+\ldots+\beta_pX_{pn}+\varepsilon_n\end{bmatrix}=X\vec{\beta}+\vec{\varepsilon}=\begin{bmatrix}1&X_{11}&X_{21}&\ldots&X_p\\1&X_{12}&X_{22}&\ldots&X_p\\&&\vdots&&\\1&X_{1n}&X_{2n}&\ldots&X_p\end{bmatrix}$$

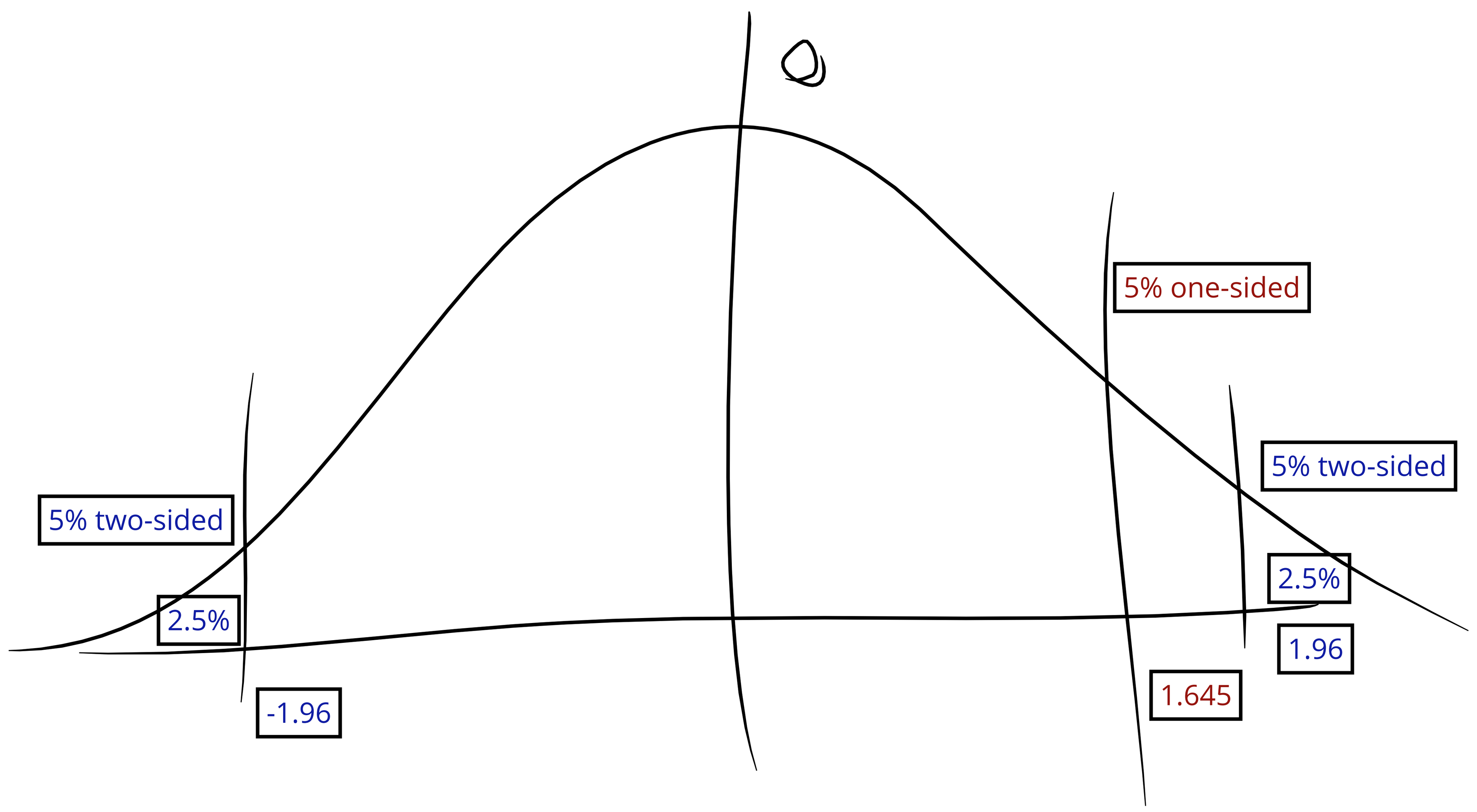
we have n equations and $(p+1)$ unknowns. In general if $n=p+1$, then there is no proble

If $n>p+1$, then it is called an "overdetermined system" − this is not realistic

If $n<p+1$, then it is an "underdetermined system" − then cannot determine the β coefficie

$$rz=0.5\ln\left(\frac{1+0.883}{1-0.883}\right)$$

$$p=P(Z<0.5)$$



$$For\ SLR\ y=\alpha+\beta x$$
$$album\ sales=\beta_0+\beta_1 adverts$$
$$H_0:\ \rho=0\ equivalent\ \beta_1=0$$
$$H_A:\ \rho\neq 0\ equivalent\ \beta_1\neq 0$$
$$9.6=t_\rho=t_{\beta_1}=\frac{b_1}{SE_{b_1}}$$
$$p-value\ for\ \beta_1\ is\ the\ same\ p-value\ for\ \rho$$

$$For\ MLR\ y=\alpha+\sum\beta x$$
$$H_0:\ \rho=0\ equivalent\ \beta_1=\beta_2=\ldots=\beta_p\ (and\ statement)$$
$$H_A:\ \rho\neq 0\ equivalent\ (or\ statement)\ one\ of\ the\ \beta's\ \neq 0$$

$$H_0:\ \rho=0\ and\ r=0.578$$
$$t=\frac{0.578\sqrt{398}}{\sqrt{1-0.335}}=\frac{r-0}{SE_r}\Rightarrow SE_r=\sqrt{\frac{1-0.335}{398}}=0.041$$
$$r_z=0.5\ ln\left(\frac{1+0.578}{1-0.578}\right)=0.659\sim N\left(0,\sqrt{\frac{1-r^2}{n-2}}\right)=N(0,0.041)$$
$$CI\ for\ \rho_z:\ r_z\pm z^*\cdot SE_{r_z}=0.659\pm 1.96\cdot 0.041=(LB=0.578,UB=0.739)$$
$$CI\ for\ \rho:\ \left(\frac{e^{2\cdot LB}-1}{e^{2\cdot LB}+1},\frac{e^{2\cdot UB}-1}{e^{2\cdot UB}+1}\right)=(0.522,0.629)$$