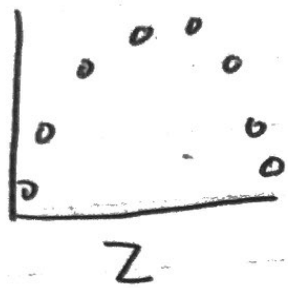
5/29 Tom's first day board notes

$Pr(z) = [z]$



- PMF returns the probability for any value of z

two criteria: $[z] \geq 0$

$\sum_{z \in S} z = 1$, within the support

Probability Distributions have moments

$\boxed{\#1}$ $E(z) = \mu = \sum_{z \in S} z[z]$ (mean)

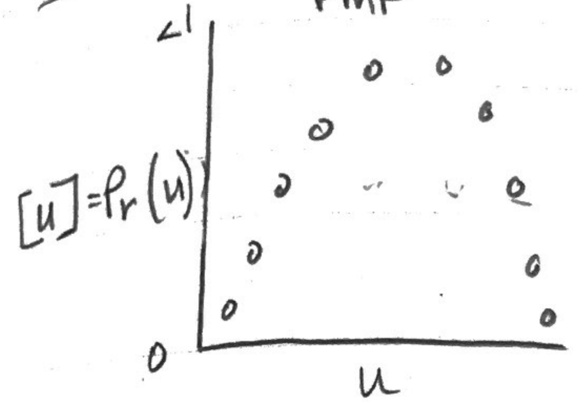
$\approx \frac{1}{n} \sum_{i=1}^{n} z_i$

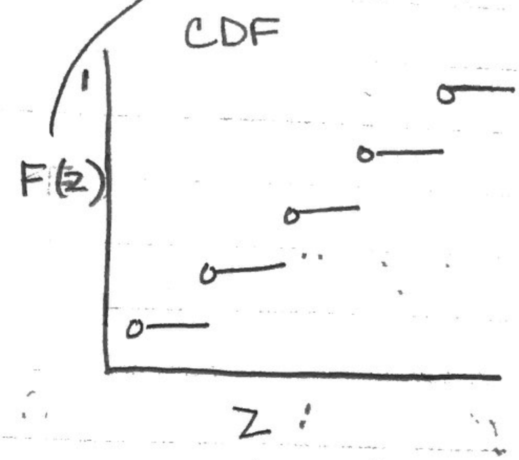
$\boxed{\#2}$ $E((z-\mu)^2) = \sigma^2 = \sum_{z \in S} (z-\mu)^2 [z]$ (varience)

$\approx \frac{1}{n} \sum_{i=1}^{n} (z_i - \mu)^2$

$$F(z) = \sum_{u<z} [u]$$

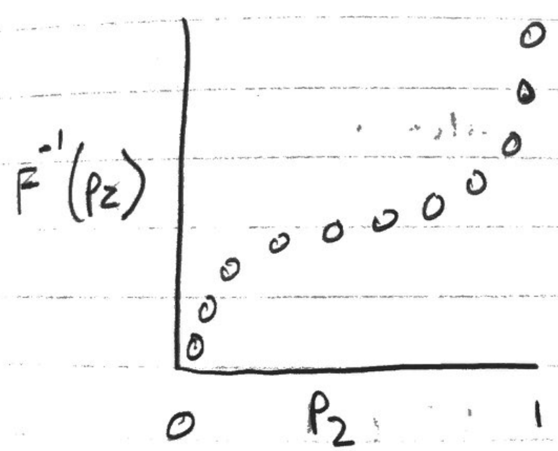
Cumulative Distribution for z





↳ prob that $u \leq z$

Quantile Function



$F^{-1}(p_z) = z$ for which $F(z) \leq p_z$

- Use to create credible intervals

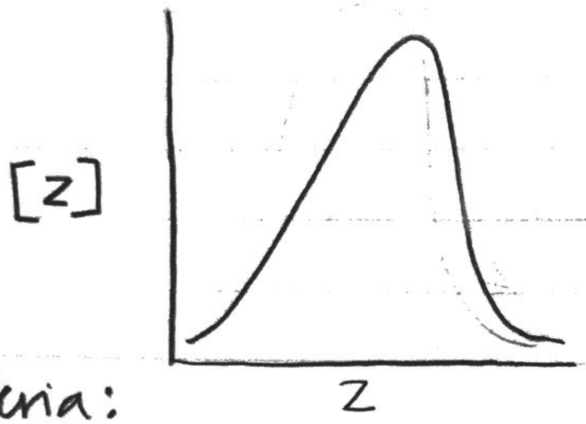
Use cases:

CDF → give value z it tells us that the RV u is $\leq z$

Quantile → give prob $\leq z$ return z
.05/.95, logical argument

Continuous RVs

↳ Infinite # of values between upper & lower points



$z \sim \text{normal}(\mu, \sigma^2)$

(Not Probability)

Prob density = values along curve, such that is true

Criteria:

$[z] \geq 0$

$$\int_{-\infty}^{\infty} [z] \, dz = 1$$

$$\Pr(a < z < b) = \int_a^b [z] \, dz$$

- The values on the y axis can be comparatively large if values on x axis are comparatively small

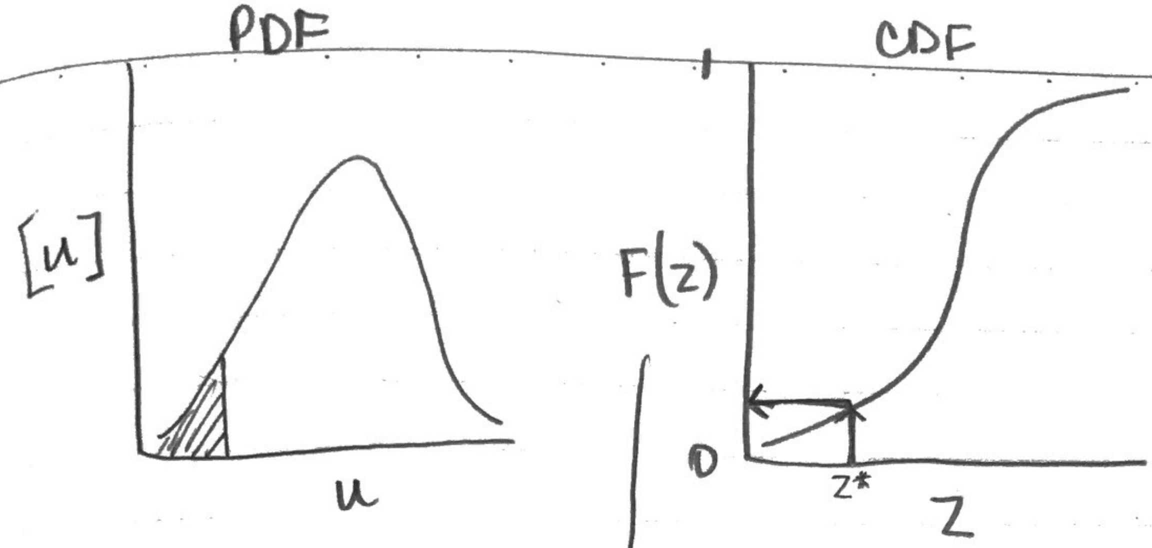
Moments

$$\#1 \quad E(z) = \mu = \int_{-\infty}^{\infty} z[z] \, dz$$

$$\approx \frac{1}{n} \sum_{i=1}^{n} z_i$$

$$\#2 \quad E(z-\mu)^2 = \sigma^2 = \int_{-\infty}^{\infty} (z-\mu)^2 [z] \, dz$$

$$\approx \frac{1}{n} \sum_{i=1}^{n} (z_i - \mu)^2$$



$$F(z) = \int_{-\infty}^{z} [u]\, du$$

★ use CDF to get area from $-\infty$ to z^*

★ The PDF is the antiderivative of the CDF

Quantile Function → understand the value of a R.V. associated w/ a probability