

quantiles \rightarrow
expected values.

q - quantile q given
 $\min \{x \mid F(x) \geq q\}$
 \downarrow
 $P(X \leq q)$
 prob mass function
 pmf

$X = \#$ of other contracts

profits = $\frac{100}{1+X} - 26$

x	P(X=x)
1	0.1
2	0.25
3	0.3
4	0.25
5	0.1

profits	prob
24	0.1
22/3	0.25
-1	0.3
-6	0.25
-28/3	0.1

$E(\text{profits}) = 24(0.1)$
 $+ \frac{22}{3}(0.25)$
 $+ (-1)(0.3)$
 $+ (-6)(0.25)$
 $+ (-\frac{28}{3})(0.1) = 1.5$

$X = \#$ the number of other contracts

$E(X) = 1(0.1) + 2(0.25) + 3(0.3) + 4(0.25) + 5(0.1) = 3$

x	P(X=x)
1	0.1
2	0.25
3	0.3
4	0.25
5	0.1

$\frac{100}{1+3} - 26 = 1$

exp profits \neq
 profits at the exp
 value of
 $\#$ contracts

$\frac{x_1 + x_2 + \dots + x_n}{n} = E(X)$

$P(X=2) = \frac{1}{10}, P(X=3) = \frac{1}{10}, P(X=5) = \frac{8}{10}$

$E(X) = 2 \cdot \frac{1}{10} + 3 \cdot \frac{1}{10} + 5 \cdot \frac{8}{10} = 4.5$

$\rightarrow E(Y) = 4 \cdot \frac{1}{10} + 9 \cdot \frac{1}{10} + 25 \cdot \frac{8}{10} = 21.3$

$Y = X^2$

outcome	prob
4	1/10
9	1/10
25	8/10

$E(X^2) = 21.3$
 $(E(X))^2 = (4.5)^2 = 20.25$

$E(X^2) \neq (E(X))^2$

$$E(X^2) \neq (E(X))^2$$

$E(X^2)$

$P(X > 1)$

$x | P(X=x)$
7

Let X be some nonnegative r.v. let $t > 0$.

Then $P(X > t) \leq \frac{E(X)}{t}$

useful when t is large

~~xxxx~~

Sample mean

$$\bar{x} = \frac{x_1 + \dots + x_n}{n}$$

long run

expected value
 $E(X)$

Sample variance

$$\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \dots + (x_n - \bar{x})^2}{n}$$

$\sigma^2 = ?$ $P(X=2) = \frac{1}{10}$, $P(X=3) = \frac{1}{10}$, $P(X=5) = \frac{8}{10}$

$\sigma^2 = E(X - \mu)^2$
 Expected value of X

$E(X) = 2 \cdot \frac{1}{10} + 3 \cdot \frac{1}{10} + 5 \cdot \frac{8}{10} = 4.5$

$$\sigma^2 = E(X - \mu)^2$$

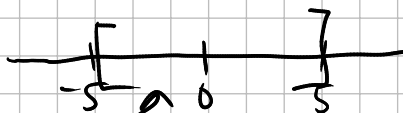
$$= (2 - 4.5)^2 \cdot \frac{1}{10} + (3 - 4.5)^2 \cdot \frac{1}{10} + (5 - 4.5)^2 \cdot \frac{8}{10}$$

$= 1.05$

algebra version $|x-0|$

$|x| \leq 5$

$\Rightarrow -5 \leq x \leq 5$



$|x| \geq 5$

