Week 11 Tuesday

March 19, 2019 8:00 AM

Quiz

x	$x-\mu$	$(x-\mu)^2$
1	-3	9
3	-1	1
5	1	1
7	3	9

$$\boxed{\mu = \frac{\text{sum}}{n} = \frac{16}{4} = 4}$$

$$\boxed{\sigma^2 = \frac{\Sigma(x-\mu)^2}{n} = \frac{\text{sum}}{n} = \frac{20}{4} = 5}$$

Pop. variance $\sigma^2 = 5$

Pop. SD $\sigma = \sqrt{5}$

Quiz Tues. 26th Section 4

Section 4 Cont'd

Recall X = # heads in 3 coin tosses

x	$P(x)$
0	0.125
1	0.375
2	0.375
3	0.125

The mean or expected value of X

$$\mu = E(x) = \Sigma x P(x)$$

formula sheet

The variance of X is σ^2

$$\sigma^2 = E(x^2) - \mu^2 \quad \text{where } E(x^2) = \Sigma x^2 P(x)$$

formula sheet

Ex 2. Given the following probability distribution:

x	$P(x)$
-5	0.15
-2	0.2
1	0.4
6	0.25

Find:

a) $P(-2.5 \le X \le 2.5)$

b) the mean of X

c) the variance of X

d) the standard deviation of X

e) the probability that an x-value lies within one standard deviation of the mean

x	
-5	
-2	
1	
6	

a) $P(-2.5 \le X \le 2.5)$

$= P(X=-2) + P(X=1)$

$= 0.2 + 0.4$

$= 0.6$

b) $\mu = E(X) = \sum x P(x)$

$= -5(0.15) + (-2)(0.2) + 1(0.4) + 6(0.25)$

$= 0.75$

c) variance σ^2

$E(x^2) = \sum x^2 P(x)$

$= (-5)^2(0.15) + (-2)^2(0.2) + 1^2(0.4) + 6^2(0.25)$

$= 13.95$

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

$= 13.95 - (0.75)^2$

$= 13.3875$

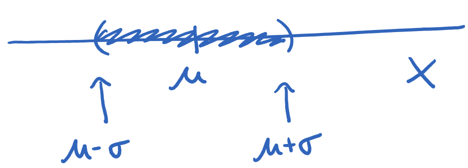
d) SD σ

$\sigma = \sqrt{\sigma^2}$

$= \sqrt{13.3875}$

≈ 3.66

e)



$P(\mu-\sigma \le X \le \mu+\sigma)$

$\mu = 0.75$
$\sigma \approx 3.66$

$= P(-2.91 \le X \le 4.41)$

x	$P(x)$
-5	
-2	
1	
6	

$= P(X=-2) + P(X=1)$

$= 0.2 + 0.4$

$= 0.6$

Ex 3. Project 1 has a 35% chance of earning \$0, a 50% chance of earning \$300,000 and a 15% chance of earning \$800,000.
Project 2 has a 60% chance of earning \$0 and a 40% chance of earning \$1,000,000.

a) Find the probability distributions of the earnings for each project
b) Find the expected earnings for each project
c) Find the standard deviation of earnings for each project
d) Which project has higher expected earnings?
e) In terms of earnings, which project is riskier?

a) X = earnings for Proj 1 (\$)

x	$P(x)$
0	0.35
300,000	0.5
800,000	0.15

Y = Proj. 2 Earnings (\$)

y	$P(y)$
0	0.6
1,000,000	0.4

b) expected value or mean (μ)

$\mu_X = 0(0.35) + 300{,}000(0.5) + 800{,}000(0.15)$
$= \$270{,}000$

$\mu_Y = 0(0.6) + 1{,}000{,}000(0.4)$
$= \$400{,}000$

c) variance σ^2
Look at Proj. 1 first

$E(X^2) = \Sigma x^2 P(x)$
$= 0^2(0.35) + (300{,}000)^2(0.5) + (800{,}000)^2(0.15) = 1.41 \times 10^{11}$ $(\$^2)$

$$\sigma_X^2 = E(X^2) - \mu_X^2$$
$$= 1.41 \times 10^{11} - (270{,}000)^2$$
$$= 6.81 \times 10^{10} \quad (\$^2)$$

variance

SD $\sigma_X = \sqrt{\sigma_X^2}$
$$= \sqrt{(6.81 \times 10^{10})}$$
$$\approx \$\ 261{,}000$$

For Proj. 2 $\qquad E(Y^2) = 4 \times 10^{11} \quad (\$^2)$

Variance $\sigma_Y^2 = E(Y^2) - \mu_Y^2$
$$= 2.4 \times 10^{11} \quad (\$^2)$$

SD $\sigma_Y = \sqrt{(2.4 \times 10^{11})}$

(Can check the details) $\qquad = \$\ 490{,}000$

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d) Proj 2 $\qquad \mu_Y > \mu_X$

e) Risker = larger variance (or larger SD)

Proj 2 $\qquad \sigma_Y > \sigma_X$