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K068

Probability & Statistics Lab-4

```
1.library(moments)
x = c(0,1,2)
p = c(1/3,1/3,1/3)
m0 = 1
m1 = sum(x*p)
m2 = sum(x*x*p)
m = c(m0, m1, m2)
raw2central(m)
print(m)
> library(moments)
> x = c(0,1,2)
> p = c(1/3,1/3,1/3)
> m0 = 1
> m1 = sum(x*p)
> m2 = sum(x*x*p)
> m = c(m0, m1, m2)
> raw2central(m)
[1] 1.0000000 0.0000000 0.6666667
> print(m)
[1] 1.000000 1.000000 1.666667
> |
```

```
1. MORF - eto 43 + et (1/3) + est (1/3) = 1/3 (1+et+eot)
  Paw moments - U, = E(x1) = Expx = 0(1/3) + 1(113) + 0(1/3)
                   - 0 + 1/3 + 4/3
     1.667
113' - E(x3) - 5x3Px
                    = 1/3+8/3
                    = 9/3
     My = E(x4) = {x4px
                    = 17/3
= 17/3
                      -0.66
     Centeral moments M.=0
M2=M2-(M1)2
            -5/3 (1)2
                 = 2/3
     M3= M3'-3M, 42'+2M,3
          - 3-3(5/3)+2(1)3
          - 3-5+2
          -0
       ely= 2/3
```

2.library(moments)

m = c(1,2,10,-30)

a = raw2central(m)

print(a)

mean = 5

print(mean)

variance=a[3]

print(variance)

skewness=a[4]

print(skewness)

```
Jobs ×
Console
       Terminal ×
> library(moments)
> m = c(1,2,10,-30)
> a = raw2central(m)
> print(a)
            6 -74
        0
[1]
     1
> mean = 5
> print(mean)
[1] 5
> variance=a[3]
> print(variance)
[1] 6
> skewness=a[4]
> print(skewness)
[1] -74
>
```

```
2. M_{2} = E((x-P)^{2})

= E((x-3)^{2})

M_{1}^{3} = E(x-3)

Q = E(x) - E(3)

Q = E(x) - 2

E(x) = 2+3 = 5

M_{2} = M_{2}^{1} - (M_{1})^{2}

= 10 - (Q)^{2}
= 10 - 4
= 6 \implies Variance

M_{3} = M_{3}^{1} - 3M_{1}^{1}M_{2}^{1} + 2M_{1}^{3}
= (-30) - 3(2)(10) + 2(2)^{3}
= -74 \implies skewness
```

```
3.x = c(0,1,2,3)

p = 1/8*choose(3,x)

m0 = 1

m1 = sum(x*p)

m2 = sum(x*x*p)

m3 = sum(x*x*x*p)

m = c(m0,m1,m2,m3)

y = raw2central(m)

print(y)

mean = m1

print(mean)

variance = y[3]

print(variance)
```

```
Console
        Terminal \times
                  Jobs ×
> x = c(0,1,2,3)
> p = 1/8*choose(3,x)
> m0 = 1
> m1 = sum(x*p)
> m2 = sum(x*x*p)
> m3 = sum(x*x*x*p)
> m = c(m0, m1, m2, m3)
> y = raw2central(m)
> print(y)
[1] 1.00 0.00 0.75 0.00
> mean = m1
> print(mean)
[1] 1.5
> variance = y[3]
> print(variance)
[1] 0.75
> |
```

```
3. Mx(t) = E(e^{tx})

= e^{to}(1/8) + e^{t}(3/8) + e^{2t}(3/8) + e^{3t}(1/8)

Mx(t) = \int_{0}^{1} + e^{t} \frac{3}{3} + e^{2t} \frac{3}{3} + e^{3t} \int_{0}^{1} \frac{1}{8} e^{2t} \frac{3}{8} e^{3t} e^{3t}
```

$$= \frac{1}{8} (3+12+9)$$

$$= \frac{24}{8}$$

$$= 3$$

$$42 = 42^{1} - (41,)^{2}$$

$$= 3 - (1.5)^{2}$$

$$= 3/4$$

$$= 0.75 \rightarrow variance$$

```
4.x = c(-2,3,1)
p = c(1/3,1/2,1/6)
m0 = 1
m1 = sum(x*p)
m2 = sum(x*x*p)
m3 = sum(x*x*x*p)
m4 = sum(x*x*x*x*p)
m = c(m0, m1, m2, m3, m4)
y = raw2central(m)
print(y)
mean=m1
print(mean)
c_of_skewness = (y[4]/y[3]^(3/2))
print(c_of_skewness)
c_{of}_{kurtosis} = (y[5]/y[3]^{(2)})
print(c_of_kurtosis)
```

```
Console
        Terminal ×
                  Jobs ×
> m1 = sum(x*p)
> m2 = sum(x*x*p)
> m3 = sum(x*x*x*p)
> m4 = sum(x*x*x*x*p)
> m = c(m0, m1, m2, m3, m4)
> y = raw2central(m)
> print(y)
           5 -5 35
[1]
    1
        0
> mean=m1
> print(mean)
[1] 1
> c_of_skewness = (y[4]/y[3]^{(3/2)})
> print(c_of_skewness)
[1] -0.4472136
> c_of_kurtosis = (y[5]/y[3]^{(2)})
> print(c_of_kurtosis)
[1] 1.4
>
```

$\mathcal{M}_{1}^{1} = \frac{1}{2} \times P_{\pi}$ $= (-2)(1/3) + 3(1/2) + 1(1/8)$ $= 1$ $\mathcal{M}_{2}^{1} = \frac{1}{2} \times 2P_{\pi}$ $= (1)(1/3) + 9(1/2) + 1(1/6)$ $= 6$ $\mathcal{M}_{3}^{1} = \frac{1}{2} \times 3P_{\pi}$ $= (-8)(1/3) + 24(1/2) + 1(1/6)$ $= 11$ $\mathcal{M}_{u}^{1} = \frac{1}{2} \times 4P_{\pi}$ $= \frac{16(1/3)}{4} \cdot \frac{1}{8} \cdot \frac{1(1/2)}{1(1/2)} + \frac{1}{1(1/6)}$ $= \frac{1}{46}$ $\mathcal{M}_{1} = 0$ $\mathcal{M}_{2} = 5$ $\mathcal{M}_{3} = -5$ $\mathcal{M}_{3} = -5$ $\mathcal{M}_{4} = 35$ $\operatorname{coeff} \cdot \operatorname{of} \operatorname{skeuwess} = \frac{-5}{5} = -0.44172$ $\operatorname{coeff} \cdot \operatorname{of} \operatorname{skeuwess} = \frac{-5}{53/2} = 5$ $\operatorname{coeff} \cdot \operatorname{of} \operatorname{skeuwess} = \frac{-5}{53/2} = 5$	4.	Raw moments: Mer = E(xer) = Exerpx
$\mathcal{M}_{1}' = \frac{1}{2} \times P \times \frac{1}{2} = \frac{1}{2} \cdot \frac{1}{2} $		10=1
$ l _{2}^{2} = 2x^{2}px$ $= (4)(\sqrt{3}) + 9(1/2) + 1(1/6)$ $= 6$ $ l _{3}^{2} = 2x^{3}px$ $= (-8)(\sqrt{3}) + 24(1/2) + 1(1/6)$ $= 11$ $ l _{2}^{2} = 2x^{4}px$ $= 16(1/3) + 81(1/2) + 1(1/6)$ $= 46$ $ l _{2} = 5$ $ l _{3} = -5$ $ l _{4} = 35$ $ coeff of skewness = -5 = -0.4472$ $= 5312$ $ coeff of portosis = -5 = 5$ $= 5$ $= 1$ $= 1$		
$ l _{2}^{2} = 2x^{2}px$ $= (4)(\sqrt{3}) + 9(1/2) + 1(1/6)$ $= 6$ $ l _{3}^{2} = 2x^{3}px$ $= (-8)(\sqrt{3}) + 24(1/2) + 1(1/6)$ $= 11$ $ l _{2}^{2} = 2x^{4}px$ $= 16(1/3) + 81(1/2) + 1(1/6)$ $= 46$ $ l _{2} = 5$ $ l _{3} = -5$ $ l _{4} = 35$ $ coeff of skewness = -5 = -0.4472$ $= 5312$ $ coeff of portosis = -5 = 5$ $= 5$ $= 1$ $= 1$		= (-2)(1/3) + 3(1/2)+1/1/0)
$= (4)(\sqrt{3}) + 9(1/2) + 1(1/6)$ $= 6$ $U_3' = \{2x^3px$ $= (-8)(\sqrt{3}) + 24(1/2) + 1(1/6)$ $= 11$ $U_4' = \{2x^4px$ $= 16(1/3) + 81(1/2) + 1(1/6)$ $= 46$ $U_4 = 0$ $U_2 = 5$ $U_4 = 35$ $coeff. of skewness = -5 = -0.4422$ 5312 $coeff. of portosis = -5 = 5$ $(5)2 = 25$		= [
		lls = Ex2Px
$ll_{3}' = \frac{1}{2} \pi^{3} P \pi$ $= (-8)(\sqrt{3}) + \omega 4(\sqrt{2}) + 1(\sqrt{6})$ $= 11$ $ll_{u}' = \frac{1}{2} \pi^{4} P \pi$ $= \frac{16(\sqrt{3})}{4} \frac{1}{8} \frac{1(\sqrt{2})}{1(\sqrt{6})}$ $= \frac{16}{46}$ $ll_{1} = 0$ $ll_{2} = 5$ $ll_{3} = -5$ $ll_{4} = 35$ $coeff \cdot of skewness = -5 = -0.4472$ $= \frac{5}{3} \frac{3}{2}$ $coeff \cdot of kurtosis = -5 = 5$ $= \frac{1}{5}$		=(4)(1/3)+9(1/2)+1(1/6)
= $(-8)(\sqrt{3}) + 24(1/2) + 1(1/6)$ = 11 Mu' = 22492 = $16(1/3) + 81(1/2) + 1(1/6)$ = 46 $M_1 = 0$ $M_2 = 5$ $M_3 = -5$ Mu = 35 $coeff \cdot of skewness = -5 = -0.442$ $coeff \cdot of portosis = -5 = 5$ $(5)^2 = 25$		= 6
= 11 Mu' = 224Px = 16(1/3) + 81(1/2) + 1(1/6) = 46 M_ = 0 M_ = 5 M_ = -5 M_ = -5 M_ = 35 coeff. of skewness = -5 = -0.4472 5312 coeff. of portosis = -5 = 5 (512 25		U3' = Ex3Px
$Mu' = 2 \times 4p_{X}$ $= 16(1/3) + 81(1/2) + 1(1/6)$ $= 46$ $M_{1} = 0$ $M_{2} = 5$ $M_{3} = -5$ $Mu = 35$ $coeff \cdot of skewness = -5 = -0.4472$ 5312 $coeff \cdot of portosis = -5 = 5$ $(5)2 = 25$		= (-8)(1/3)+24(1/2)+1(1/6)
= 16(1/3) 4 81(1/2) + 1(1/6) = 46 M=0 M2=5 M3=-5 Mu=35 coeff. of skewness = -5 = -0.4472 5312 coeff. of partosis = -5 = 5 (-5)2 = 5		= 11
= 16(1/3) 4 81(1/2) +1(1/6) = 46 M=0 M2=5 M3=-5 Mu=35 coeff. of skewness = -5 =-0.4472 53/2 coeff. of partosis = -5 = 5 (-5)2 = 5		Mu = 224Px
=46 M=0 Mz=5 M3=-5 Mu=35 coeff. of skewness= -5 =-0.4472 5312 coeff. of kwitosis= -5 = 5 (5)2 & 5		
$Mz = 5$ $Mz = -5$ $Mu = 35$ $coeff \cdot Of skewness = -5 = -0.442$ $coeff \cdot Of portosis = -5 = 5$ $(5)2$ $= 1$ $= 1$		
$43 = -5$ $4u = 35$ $coeff \cdot of skewness = -5 = -0.4472$ $coeff \cdot of portosis = -5 = 5$ $(5)2 = 25$		U=0
$uu = 35$ $coeff \cdot of skeuwess = \frac{-5}{5^{3/2}} = -0.4472$ $coeff \cdot of portosis = \frac{-5}{(5)^2} = \frac{5}{25}$ $= \frac{1}{5}$		M2=5
coeff. of skewness = $\frac{-5}{5312}$ = $\frac{-0.4472}{5312}$ coeff. of partosis = $\frac{-5}{(5)2}$ = $\frac{5}{25}$		M3 = - 5
coeff of purtosis = -5 - 5 (5)2 25		Uu = 35
coeff of purtosis = -5 - 5 (5)2 25		coeff. of skewness = -5 = -0.4472
- 1 5		5312
- 1 5		coeff of purtosis = -5 = 5
5.		(5)2 as
5.		- 1
= 1.4.		-
- 1.4		= 1.4