Lecture 8

finding the moments about zero and moments about mean

1. moments about zero:

$x := \begin{pmatrix} 1 \\ 2 \\ 3 \\ 1 \\ 2 \end{pmatrix}$ is the set of sample observations and

$N := 5$ is the no. of observations

as moment about zero is equal to E(x^r)

hence the rth moment about zero is $mz(r) := \frac{\sum_{i=0}^{N-1} \left(x_i\right)^r}{N}$

$r := 1..4$

$mz(r) =$

1.8
3.8
9
23

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2. Moment about mean

$$mm(r) := \frac{\sum_{i=0}^{N-1} \left(x_i - mz(1)\right)^r}{N}$$ is the rth sample moment about mean

where $mm(2) = 0.56$ is the sample variance

$v := \sqrt{mm(2)}$ is standard deviation

$r =$	$mm(r) =$
1	0
2	0.56
3	0.144
4	0.579

$$skewness := \frac{mm(3)}{mm(2)^{\frac{3}{2}}}$$

$$kurtosis := \frac{mm(4)}{mm(2)^{2}}$$

$skewness = 0.344$ there is a right and weak skewed

$kurtosis = 1.847$ the shape of distribution is thin

Moments for grouped data

1. Moments about zero

$X := \begin{pmatrix} 5 \\ 15 \\ 25 \\ 35 \end{pmatrix}$ are the sample categories and $F := \begin{pmatrix} 4 \\ 3 \\ 7 \\ 6 \end{pmatrix}$ are the frequencies of each category

$n := 3$

hence the no. of observations equals to $\sum_{i=0}^{n} F_i = 20$

$$MZ(r) := \frac{\sum_{i=0}^{n} \left[\left(X_i\right)^r F_i \right]}{\sum_{i=0}^{n} F_i}$$

is the rth sample moment about mean

$r := 1..4$

$r =$

1
2
3
4

$MZ(r) =$

22.5
625
$1.886 \cdot 10^{4}$
$5.946 \cdot 10^{5}$

then the mean equal to $MZ(1) = 22.5$

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2. Moments about Mean

$$MM(r) := \frac{\sum_{i=0}^{n} \left[\left[\left(X_i - MZ(1)\right)^r\right] \cdot F_i\right]}{\sum_{i=0}^{n} F_i}$$ is the rth sample moment about mean

where $MM(2) = 118.75$ is the sample variance

$v := \sqrt{MM(2)}$ is standard deviation

$v = 10.897$

$v^2 = 118.75$ is a variance

$r =$

1
2
3
4

$MM(r) =$

0
118.75
-543.75
$2.657 \cdot 10^4$

$$skewness := \frac{MM(3)}{MM(2)^{\frac{3}{2}}}$$

$$kurtosis := \frac{MM(4)}{MM(2)^2}$$

$skewness = -0.42$ there is a left and weak skewed

$kurtosis = 1.884$ the shape of distribution is thin