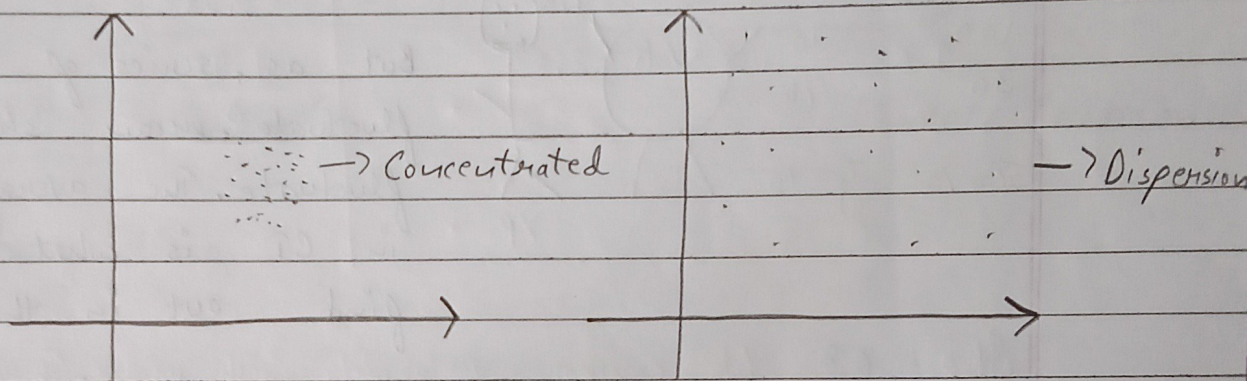


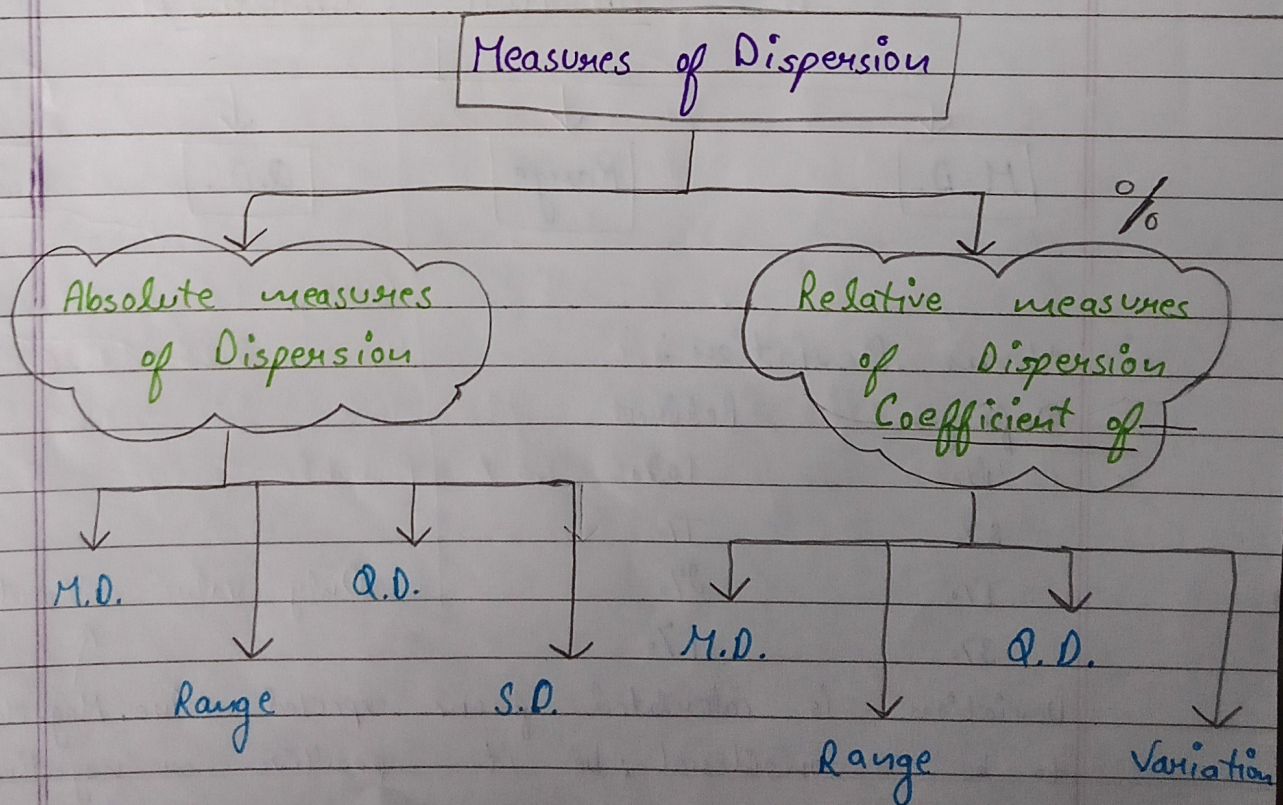
Unit -2

Dispersion

What is meant by dispersion?

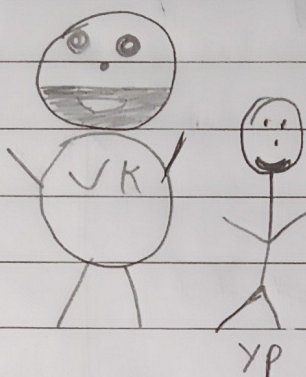


Scatteredness of data is called dispersion.



Why MOD is referred as second order of averages?

Less Consistent	(x)	(y)	More consistent
	Yusuf Pathan	Virat Kohli	
	150	70	
	0	70	
	100	70	
	30	70	
	$\bar{x} = 70$	$\bar{y} = 70$	



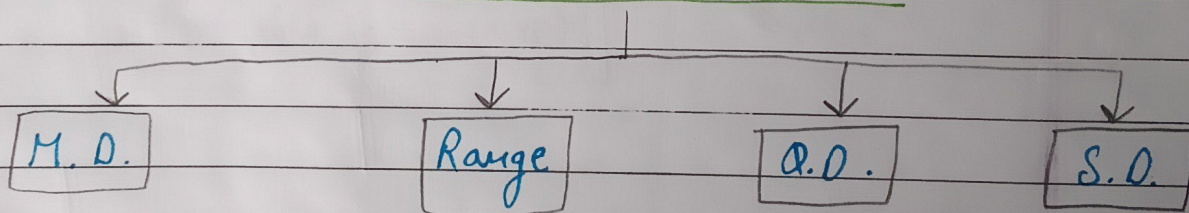
Mean $\rightarrow$ expected value $\rightarrow$ We believe ki agla observation CT ke aas pas hoga.

But as, series of observations fluctuate, mean should also fluctuate. The average fluctuation in CT is what we should find out in the chapter.

$CT \pm MOD$

$\rightarrow$ avg. fluctuation in CT

ABSOLUTE MEASURES

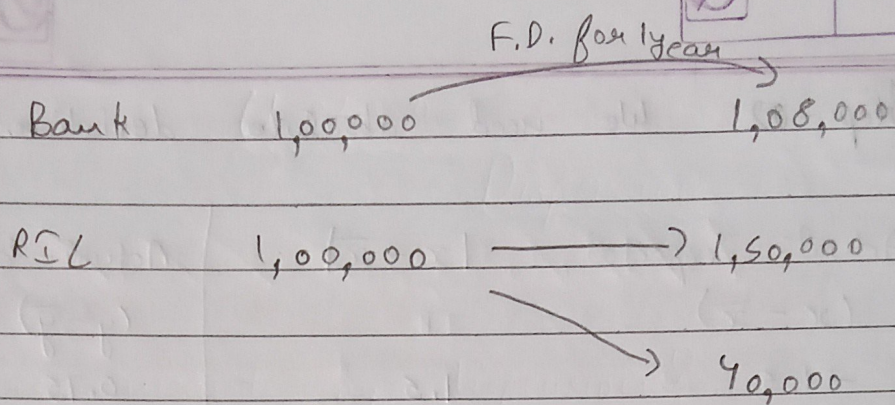


(i) Mean Deviation:

Infosys	Reliance
4%	10%
8%	7%
7%	9%
3%	11%

Only value without considering signs

Deviation is calculated from expected value. Magnitude has to be considered; be it positive or negative deviation.



Fluctuation ↑

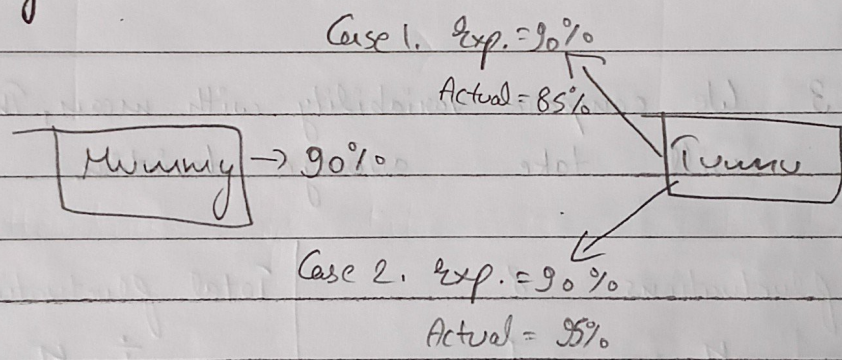
MOD ↑

RISK ↑

Deviation = |Actual - Expected|

→ Direct Relation

Story time



★ 3 Steps to calculate mean deviation :

Step-01 Calculate deviation from $\bar{x}$ / x_{mo} / x_{md}

Infosys (x)	Actual - Expected (x - $\bar{x}$)	Realiance (y)	Actual - Expected (y - $\bar{y}$)
4	-1.5	10	0.75
8	2.5	7	-2.25
7	1.5	9	-0.25
3	-2.5	11	1.75
	<u>0</u>		<u>0</u>
$\bar{x} = 5.5\%$		$\bar{y} = 9.25$	

Step - 02 We need absolute deviation. Therefore, use modulus.

Actual - expected ($x - \bar{x}$)	$ x - \bar{x} $	Actual - expected ($y - \bar{y}$)	$ y - \bar{y} $
-1.5	1.5	0.75	0.75
2.5	2.5	-2.25	2.25
1.5	1.5	-0.25	0.25
-2.5	2.5	1.75	1.75
<u>0</u>	<u>8</u>	<u>0</u>	<u>5</u>

Step - 03 We compare variability with mean. Therefore, we will take average deviation.

$$\begin{aligned} \text{Total fluctuations} &= 8 \\ \div n &= 4 \\ &= \underline{\underline{2}} \\ &\swarrow \\ &\text{Mean} \\ &\text{Deviation} \end{aligned}$$

$$\begin{aligned} \text{Total fluctuations} &= 5 \\ \div n &= 4 \\ &= \underline{\underline{1.25}} \\ &\swarrow \\ &\text{Mean} \\ &\text{Deviation} \end{aligned}$$

Interpretation $\rightarrow$

$$\text{Max. } 5.5 + 2 = 7.5$$

$$\text{Min. } 5.5 - 2 = 3.5$$

$$\text{Probable range} = 3.5 - 7.5 \%$$

Interpretation $\rightarrow$

$$\text{Max. } 9.25 + 1.25 = 10.5$$

$$\text{Min. } 9.25 - 1.25 = 8$$

$$\text{Probable range} = 8 - 10.5 \%$$

Final Formula of mean deviation:

$$M.D. = \frac{\sum |x - \bar{x}|}{n}$$

* Unless otherwise stated M.D. is calculated from mean.

For eg.

Calculate M.D.

x	$(x - \bar{x})$	$ x - \bar{x} $
2	-3	3
4	-1	1
6	1	1
8	3	3
	<u>0</u>	<u>8</u>

$$\bar{x} = 5$$

$$MD = \frac{8}{4} = 2$$

$$\text{Max. } 5 + 2 = 7$$

$$\text{Min. } 5 - 2 = 3 \quad 7-3\%$$

D.O.C. $\rightarrow$

$$\text{Type } 2+4+6+8 = \div 4 = 5$$

$$\text{Type } 2-5 \quad M-$$

$$4-5 \quad M-$$

$$6-5 \quad M+$$

$$8-5 \quad M+$$

$$MRC \div 4$$

Exg. Calculate: mean deviation from median.

$x: 7, 8, 8, 7, 12, 14, 11, 18, 15, 26$
13

$$x_{md} = 13$$

$$MD = \frac{\sum |x - x_{md}|}{n}$$

$$= \frac{62}{10} = 6.2$$

Exg. Calculate M.D. of.

$x: 4, 9, 7, 6, 10, 12, 8$

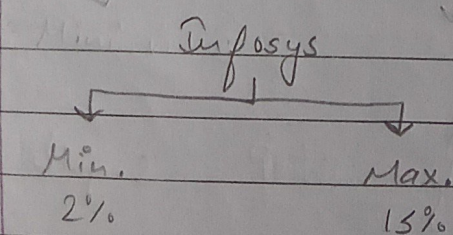
$$MD = \frac{\sum |x - \bar{x}|}{n}$$

$$= \frac{14}{7} = 2$$

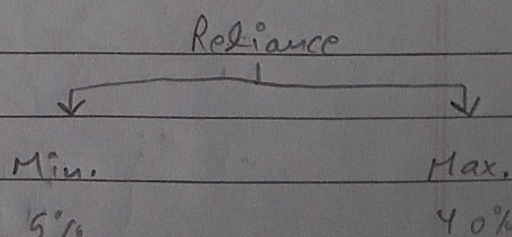
(ii) **Range**: "It is the maximum area within which a variable can dance."

It is the **quickest** measures of dispersion.

$$\# \text{ Range} = \text{Maximum} - \text{Minimum}$$



$$\text{Range} = 15 - 2 = 13\%$$



$$\text{Range} = 40 - 5 = 35\%$$

Ex. 2, 8, 10, 7, 6, 90, 94, 80, 16, 2, 8
Calculate Range

Max. Value = 94

Min. Value = 2

$$\text{Range} = 94 - 2 \\ = 92 \quad \underline{\text{Ans}}$$

★ Limitation:

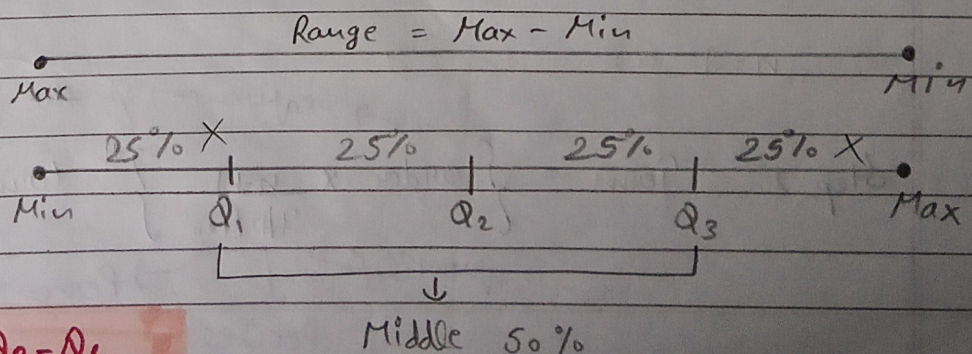
1. It is highly inaccurate & may lead to misleading conclusions.

V.K. $\rightarrow$ 80, 85, 92, 83, 0, 150, 76, 84

$$\text{Range} = 150 - 0 = 150$$

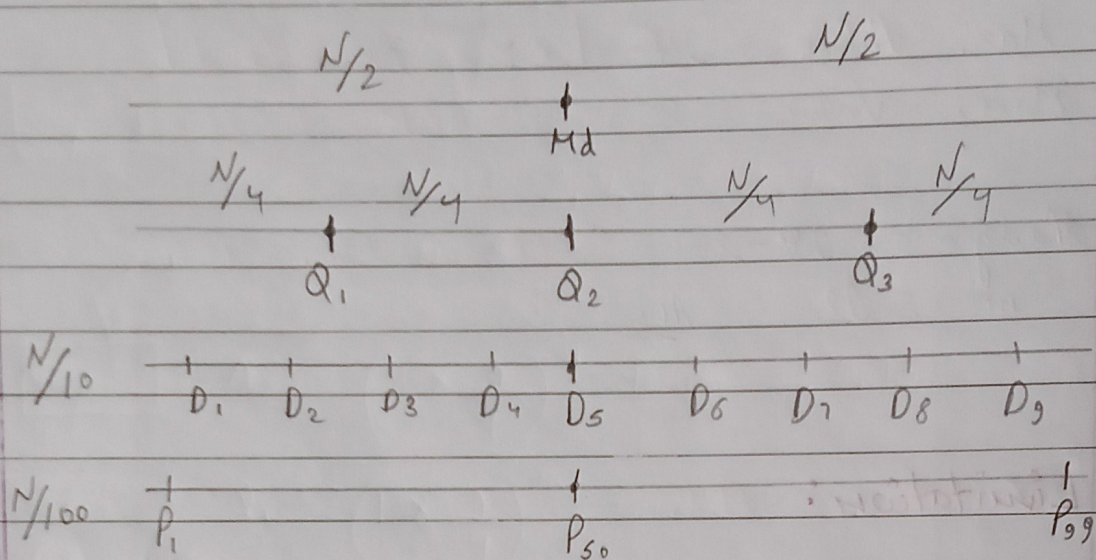
The problem with range is that it concludes V.K. is highly inconsistent but the data shows otherwise.

(iii) Quartile Deviation: Unlike range, it is not affected by extremities of the observation.



$$\# \text{ Q.D.} = \frac{Q_3 - Q_1}{2}$$

→ Concept of Partition Values



$$Md = Q_2 = D_5 = P_{50}$$

$x: 2, 7, 18, 9, 6, 15, 4, 3, 21$
Calculate median, D_5 , Q_3 , P_{77}

Step 1 Arrange in increasing order.

2, 3, 4, 6, 7, 9, 15, 18, 21

$n = 9$

Step 2 Term = $\left\{ \text{order} \times \frac{n+1}{4/10/100} \right\}^{\text{th}} \text{ term}$

Sequence of the partition value

quantiles $\downarrow$ Deciles $\downarrow$ Percentiles

$$Q_5 = \left(\frac{5 \times 9 + 1}{10} \right)^{\text{th}} \text{ term} = 5^{\text{th}} \text{ term}$$

$$Q_3 = \left(\frac{3 \times 9 + 1}{4} \right)^{\text{th}} \text{ term} = 7.5^{\text{th}} \text{ term}$$

$$P_{77} = \left(\frac{77 \times 9 + 1}{100} \right)^{\text{th}} \text{ term} = 7.7^{\text{th}} \text{ term}$$

Step 3 Value of the term = Base term +
 $(\text{age waliterms} - \text{Base term}) \times \text{decimal Part}$

$$D_5 = 5^{\text{th}} \text{ term} = 7 \quad \underline{\text{Ans}}$$

$$Q_3 = 7.5^{\text{th}} \text{ term} = VII + (VIII - VII) \times 0.5$$

$$Q_3 = 15 + (18 - 15) \times 0.5 = 16.5 \quad \underline{\text{Ans}}$$

$$P_{77} = 7.7^{\text{th}} \text{ term} = VII + (VIII - VII) \times 0.7$$

$$P_{77} = 15 + (18 - 15) \times 0.7 = 17.1 \quad \underline{\text{Ans}}$$

For e.g. Calculate Q.D.

$x: 2, 4, 8, 10, 12, 16, 4, 9$

Step 1 : Increasing Order

$2, 4, 4, 8, 9, 10, 12, 16$

$n = 8$

Step 2 : $Q_3 = \left(3 \times \frac{9}{4}\right)^{th} \text{ term} = 6.75$

$Q_1 = \left(1 \times \frac{9}{4}\right)^{th} \text{ term} = 2.25$

Step 3 : $Q_3 = 6.75^{th} \text{ term}$

$= \sqrt{1} + (\sqrt{11} - \sqrt{1}) \times 0.75$

$= 10 + (12 - 10) \times 0.75$

$= 11.5$

$Q_1 = 2.25^{th} \text{ term}$

$= \sqrt{1} + (\sqrt{11} - \sqrt{1}) \times 0.25$

$= 4 + (4 - 4) \times 0.25$

$= 4$

Step 4 : $Q.D. = \frac{Q_3 - Q_1}{2}$

$Q.D. = \frac{11.5 - 4}{2}$

$Q.D. = 3.75$ Ans

★ $Q_3 - Q_1 = \text{Inter quartile Range}$

★ $\frac{Q_3 - Q_1}{2} = \text{Semi - inter quartile range}$

(iv) Standard Deviation

Britania - Company

Year	Return
2001	10%
2002	12%
2003	18%
2004	16%
2005	14%

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \text{Average Return} = \frac{10 + 12 + 18 + 16 + 14}{5}$$

$$\bar{x} = 14\%$$

Step. 01 Calculate deviation from A.M.

x_i	10%	12%	18%	16%	14%
$x - \bar{x}$	-4%	-2%	+4%	+2%	0%

Step. 02 Calculate sum of squares of deviation:

$x - \bar{x}$	-4%	-2%	+4%	+2%	0%
$(x - \bar{x})^2$	16% ²	4% ²	16% ²	4% ²	0% ²
$\sum (x - \bar{x})^2$	= 40% ²				

Step. 03 Calculate average deviation in right unit.

$$\begin{aligned} \text{Total deviation} &= \sum (x - \bar{x})^2 = 40\%^2 \\ \div n & \qquad \qquad \qquad \div 5 \\ & \qquad \qquad \qquad 8\%^2 \rightarrow \text{Variance} \end{aligned}$$

$$\sqrt{\frac{\sum (x - \bar{x})^2}{n}} = \sqrt{8\%^2} = 2.82\% \rightarrow \text{Standard deviation}$$

Final Formula

$$\text{Standard deviation} = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

$$\text{Variance} = \frac{\sum (x - \bar{x})^2}{n}$$

E.g. Calculate S.D. of following stocks:

Infosys

Reliance

80%

10%

85%

12%

70%

08%

75%

04%

→ Infosys

Reliance

(x)	(x - $\bar{x}$)	(x - $\bar{x}$) ²
80	2.50	6.25
85	7.50	56.25
70	-7.50	56.25
75	-2.50	6.25
		<u>125</u>

(y)	(y - $\bar{y}$)	(y - $\bar{y}$) ²
10	1.50	2.25
12	3.50	12.25
08	-0.50	0.25
04	-4.50	20.25
		<u>35</u>

$$\bar{x} = 77.50$$

$$\bar{y} = 8.50$$

$$\text{Variance} = \frac{\sum (x - \bar{x})^2}{n} = \frac{125}{4} = 31.25$$

$$\text{Variance} = \frac{\sum (y - \bar{y})^2}{n} = \frac{35}{4} = 8.75$$

$$S.D. = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} = \sqrt{31.25\%} = 5.59\%$$

$$S.D. = \sqrt{\frac{\sum (y - \bar{y})^2}{n}} = \sqrt{8.75\%} = 2.95\%$$

$$= 5.59\%$$

$$= 2.95\%$$

D.O.C. →

$$\text{Type } 80 + 85 + 70 + 75 \div 4$$

$$\text{Type } 80 - 77.50 \times = M+$$

$$85 - 77.50 \times = M+$$

$$70 - 77.50 \times = M+$$

$$75 - 77.50 \times = M+$$

$$MRC \div 4 = \sqrt{\quad}$$

D.O.C. →

$$\text{Type } 10 + 12 + 08 + 04 \div 4$$

$$\text{Type } 10 - 8.50 \times = M+$$

$$12 - 8.50 \times = M+$$

$$08 - 8.50 \times = M+$$

$$04 - 8.50 \times = M+$$

$$MRC \div 4 = \sqrt{\quad}$$

Shortcut Formula

$$S.D. = \sqrt{\frac{\sum x^2 - (\sum x)^2}{n}}, \text{ Var} = \frac{\sum x^2 - (\sum x)^2}{n}$$

Infesys			Reliance		
x	x^2	$\sum x = 80+85+70+75$	y	y^2	$\sum y = 10+12+8+4$
80	6400	4	10	100	4
85	7225	$= 77.50$	12	144	$= 8.5$
70	4900		08	64	
75	5625	$S.D. = \sqrt{\frac{24150 - (77.5)^2}{4}}$	04	16	$S.D. = \sqrt{\frac{324 - (8.5)^2}{4}}$
	24150			324	
$S.D. = 5.59$			$S.D. = 2.95$		
D.O.C. $\rightarrow \frac{24150}{4} M+$			D.O.C. $\rightarrow \frac{324}{4} M+$		
$77.5^2 M-$			$8.5^2 M-$		
MRC $\checkmark$			MRC $\checkmark$		

□ Properties of S.D.

(1) It is the most popular measure of dispersion.

(2) There is a shortcut formula:

Applicability $\rightarrow$ Jab bhi koi balancing figure nikalna ho, toh always use shortcut formula

$$S.D. = \sqrt{\frac{\sum x^2 - (\sum x)^2}{n}}$$

(3) $SD^2 = \text{Variance}$

$\sigma^2 = \text{var}(x)$

OR $\sigma = \sqrt{\text{Variance}}$

Q. Calculate variance if S.D. is 8.

S.D. = 8

Variance = $SD^2 = 8^2$
 $= 64$

Q. If variance is 81, how much is S.D.?

$\sqrt{\text{Var.}} = \text{S.D.}$

$\sqrt{81} = 9$ Ans.

(4) S.D. is represented by आधा σ ।

$\sigma \rightarrow \text{Sigma}$

(5) S.D. of first n natural no's:

$SD = \sqrt{\frac{n^2 - 1}{12}}$

0, 1, 2, 3, 4, 5 $\rightarrow$ No

1, 2, 4, 5, 6 $\rightarrow$ No

2, 3, 4, 5, 6 $\rightarrow$ No

1, 2, 3, 4, 5, 6 $\rightarrow$ Yes

E.g. Calculate S.D. of 1, 2, 3, 4, 5, 6

$SD = \sqrt{\frac{n^2 - 1}{12}} = \sqrt{\frac{35}{12}}$

$SD = 1.7078$

E.g. Calculate S.D. of 1, 2, 3, 4.

$$S.D. = \sqrt{\frac{n^2 - 1}{12}} = \sqrt{\frac{15}{12}}$$

$$S.D. = 1.1180$$

(6) S.D. between 2 numbers is $\frac{|a-b|}{2}$ or $\frac{\text{difference of 2 no.'s}}{2}$

or half of range. (Also applicable on M.D.)

E.g. Calculate S.D. of 8 & 10

$$S.D. = \frac{|10-8|}{2} = \frac{2}{2} = 1$$

No M.O.D. is negative
S.D., M.D., R.D., Range
are always +ve.

(7) If all the observations are repeated for the same no. of times then count it only once.

Q. 2, 5, 7, 5, 7, 2, 5
No

(It is also applicable on M.D.)

E.g. Calculate S.D. of 2, 3, 4, 4, 3, 2. Yes

S.D. of 2, 2, 3, 3, 4, 4 = S.D. of 2, 3 & 4

$$S.D. (\sigma) \rightarrow \text{Type } 2+3+4 \div 3 = 3$$

$$\text{Type } 2-3 \times 7 = M+$$

$$\text{Type } 3-3 \times = M+$$

$$\text{Type } 4-3 \times = M+$$

$$\text{Type } MRC \div 3$$

$$\text{Type } = \sqrt{\quad}$$

$$S.D. = 0.8164$$

Ans

(8) S.D. has desirable mathematical properties.
It means combined S.D. can be calculated.

$$\sigma_{12} = \sqrt{\frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2)}{n_1 + n_2}}$$

n_1 = no. of observations of group 1

n_2 = no. of observations of group 2

σ_1 = S.D. of group 1

σ_2 = S.D. of group 2

$d_1 = \bar{x}_{12} - \bar{x}_1$

$d_2 = \bar{x}_{12} - \bar{x}_2$

E.g. Calculate Combined S.D.

Infosys (x_1)		Realiance (x_2)	
2001	10%	2001	10%
2002	12%	2002	12%
2003	18%	2003	8%
2004	12%		
$n_1 = 4$		$n_2 = 3$	
$\sigma_1 = 3$		$\sigma_2 = 1.6329$	
$\bar{x}_1 = 13$		$\bar{x}_2 = 10$	

$$\bar{x}_{12} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2} = \frac{4 \times 13 + 3 \times 10}{7}$$

$$\bar{x}_{12} = 11.71$$

$$d_1 = \bar{x}_{12} - \bar{x}_1$$

$$d_1 = 11.71 - 13$$

$$d_1 = -1.29$$

$$d_2 = \bar{x}_{12} - \bar{x}_2$$

$$d_2 = 11.71 - 10$$

$$d_2 = 1.71$$

$$\sigma_{12} = \sqrt{\frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2)}{n_1 + n_2}}$$

$$\sigma_{12} = \sqrt{\frac{4(3^2 + (-1.29)^2) + 3(1.6329^2 + 1.71^2)}{4 + 3}}$$

$$\sigma_{12} = \sqrt{\frac{4(9 + 1.66) + 3(2.66 + 2.92)}{7}}$$

$$\sigma_{12} = \sqrt{\frac{42.64 + 16.74}{7}}$$

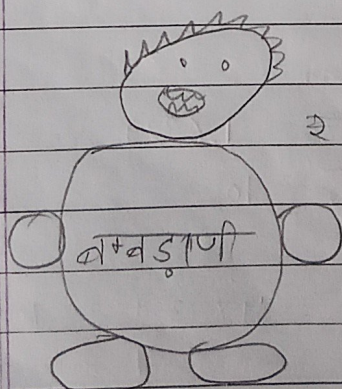
$$\sigma_{12} = \sqrt{\frac{59.38}{7}}$$

$$\sigma_{12} = \sqrt{8.48}$$

$$\boxed{\sigma_{12} = 2.91} \quad \underline{\text{Ans}}$$

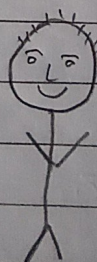
Relative Measures of Dispersion - Whenever comparison is involved, always use relative M.O.D.

Concept:



₹ 4 Cr. मुकसान
₹ 4000 Cr. Earnings

0.1%



Rs. 2000 मुकसान
Earnings Rs. 20,000 p.m.

10%

Relative Measures

Coefficients

(i) Coefficient of M.D.

$$M.D. = \frac{\sum |x - \bar{x}|}{n} \quad \rightarrow \text{Risk}$$

$$\text{Mean / Mode / Median} = \text{Return}$$

$$\text{Coefficient of M.D.} = \frac{\text{Risk} \times 100}{\text{Return}}, \quad \frac{M.D. \times 100}{\bar{x} / x_m / x_{md}}$$

e.g. Decide, which is a more stable stock?

Years	Infosys		Years	Reliance	
2001	8%	$\bar{x} = 10.5$	2001	18%	$\bar{y} = 11.5$
2002	12%	M.D. = 3.5	2002	12%	M.D. = 3.5
2003	16%		2003	9%	
2004	6%		2004	7%	
Coefficient of M.D. = $\frac{3.5}{10.5} \times 100$			Coefficient of M.D. = $\frac{3.5}{11.5} \times 100$		
= 33.33 %			= 30.43 %		

Lower the Better!

We will select REL as it has lower Coeff. of M.D.

(ii) Coefficient of range

It explains risk as a % of returns.

$$\text{Coefficient of risk} = \frac{\text{Avg. risk}}{\text{Avg. returns}} \times 100$$

$$\text{Coefficient of Range} = \frac{\text{Max} - \text{Min}}{\text{Max} + \text{Min}} \times 100$$

E.g. Calculate coefficient of range.

α : 2, 4, 6, 10, 18, 7, 9, 26

$$\text{Max.} = 26$$

$$\text{Min.} = 2$$

$$\text{Coefficient of range} = \frac{26 - 2}{26 + 2} \times 100$$

$$= \frac{24}{28} \times 100$$

$$= 85.71\%$$

(iii) Coefficient of Quartile Deviation

$$\text{Coefficient of Q.D.} = \frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$$

e.g. Calculate coefficient of Q.D.:

$$Q_1 = 80 \quad Q_3 = 120$$

$$\begin{aligned} \text{Coefficient of Q.D.} &= \frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100 \\ &= \frac{120 - 80}{120 + 80} \times 100 \\ &= 20\% \end{aligned}$$

Other way

$$\begin{aligned} \text{Coefficient of Q.D.} &= \frac{\frac{Q_3 - Q_1}{2}}{\frac{Q_3 + Q_1}{2}} \times 100 \\ &= \frac{Q.D.}{Q_2 = M_d} \times 100 \end{aligned}$$

$$\text{Coefficient of Q.D.} = \frac{Q.D.}{M_d} \times 100$$

(iv) Coefficient of variation

It is risk as a % of return

$$\text{Risk} = \text{S.D.}$$

$$\text{Return} = \bar{x}$$

$$\text{Coefficient of variation} = \frac{\sigma}{\bar{x}} \times 100$$

Decision Rule:

"Lower it is, the better it is"

It is a measure of risk showing it as a % of return,

Whenever, consistency is asked always calculate S.D. If consistency needs to be compared; always calculate coefficient of variation (chupki)

E.g. Find out that which is the more consistent stock?

Infosys

$$80\% \quad \bar{x} = 77.5$$

$$85\% \quad \text{S.D.} = 5.590$$

$$70\%$$

$$75\%$$

$$\text{Coff. of variation} = \frac{\sigma}{\bar{x}} \times 100$$

$$= \frac{5.590}{77.5} \times 100$$

$$= 7.21\%$$

Infosys is the more consistent stock

Reliance

$$10\% \quad \bar{y} = 8.5$$

$$12\% \quad \text{S.D.} = 2.958$$

$$08\%$$

$$07\%$$

$$\text{Coff. of variation} = \frac{\sigma}{\bar{y}} \times 100$$

$$= \frac{2.958}{8.5} \times 100$$

$$= 34.8\%$$

Ex. Who is the more consistent batter?

Virat Kohli		Yusuf Pathan	
80	$\bar{x} = 65$	10	$\bar{y} = 40$
75	S.D. = 39.49	12	S.D. = 55.07
120		18	
0		150	
50		10	

$$C.V. = \frac{\sigma}{\bar{x}} \times 100$$

$$= \frac{39.49}{65} \times 100 = 60.75\%$$

$$C.V. = \frac{\sigma}{\bar{y}} \times 100$$

$$= \frac{55.07}{40} \times 100 = 137.67\%$$

Decision: More Consistent

Less Consistent

लावारिश Properties 2.0! → It is applicable on all the MOD (SD, Range, QD, HD)

	C	T	MOD
Δ of origin	✓		X
Δ of scale	✓		✓
Δ of sign	✓		X

Δ of scale			Δ of origin		
X	2x	x/2	x+2	x-2	-x
2	4	1	4	0	-2
4	8	2	6	2	-4
6	12	3	8	4	-6
8	16	4	10	6	-8
$\sigma = 2.23$	$\sigma = 4.46$	$\sigma = 1.11$	$\sigma = 2.23$	$\sigma = 2.23$	$\sigma = 2.23$

If all the observations are affected by scale, MOD's are similarly affected.

For e.g. S.D. of x is 4. The relationship b/w x & y is given as $2x + 4y = 8$. Calculate S.D. of y .

Step 1. Puri dhara ek taraf, jisko dundi nahi hai wo ek taraf.

Step 2. Ignore origin & sign & only consider scale & put the value.

$$2x + 4y = 8 \Rightarrow 4y = -2x + 8$$

$$y = \frac{-2x + 8}{4}$$

~~$$y = \frac{-x + 2}{2}$$~~

$$\sigma_y = \frac{2}{4} \times 4$$

$$\sigma_y = 2 \text{ Ans}$$

e.g. $2x + 9y = 7$

Calculate M.D. of y if M.D. of x is 8

$$2x + 9y = 7 \Rightarrow y = \frac{-2x + 7}{9}$$

$$y = \frac{2}{9} \times 8$$

$$y = 1.77$$

e.g. $x: 2 \quad 4 \quad 6 \quad 8$
 $y: -3 \quad -1 \quad 1 \quad 3$

S.D. of x is 4. Find σ_y

~~$2x - 3y$~~ $y = x - 5$
 $\sigma_y = \sigma_x$
 $\sigma_y = 4$

✓ Relationship b/w S.D., Q.D. & M.D.

“ 4, 5, 6 कठके सम्बन्ध मे क्दम ”

$$\begin{array}{ccccc} 4 \text{ S.D.} & = & 5 \text{ M.D.} & = & 6 \text{ Q.D.} \\ \downarrow & & \downarrow & & \downarrow \\ \text{Sambandh} & & \text{me} & & \text{Kadam} \end{array}$$

Q. S.D. = 8 Find Q.D.

$$4 \text{ S.D.} = 6 \text{ Q.D.}$$

$$\frac{4 \times 8}{6} = \text{Q.D.} \Rightarrow \text{Q.D.} = 5.333 \text{ Ans}$$

लावारिस Property is N.A. on:

- 1) Variance
- 2) Relative M.O.D