mof ① CAGR = $P(1+r)^n$

* Perpetuity = $fv = \infty$ $PV = \frac{Pre}{r}$

* growing Pre

$fv = \infty$

$PV = \frac{Per}{r-g}$

* Bond = $\left[In \times PVIFA\ @ r\%\ \text{no of Year} \right] \times \left[MV \times PVIF\ @ r\%\ \text{no of Year} \right]$

After MRC Before MRC

---

* Liner equality

* maximum - Not more than - up to $\leq$

At the most - Avaiable - only

* minimum - At Least - Not Less than $\geq$

---

* Logarithum

$\log_a a = 1$ $\log_a 1 = 0$

$\log_a mn = \log_a m + \log_a n$

$\log_a \frac{m}{n} = \log_a m - \log_a n$

$\log_a m^n = n \log_a m$

$\log_b m = \frac{\log m}{\log b} = \frac{\log_a m}{\log_a b}$

ગુજરાંતી

Regression

→ mathematical relation of Two Variable Require
y when x is given
x when y is given

y on x $\quad y-\bar{y} = b_{yx}(x-\bar{x})$

x on y $\quad x-\bar{x} = b_{xy}(y-\bar{y})$

* Coefficient

y on x: r given $\quad b_{yx} = r \cdot \frac{SDy}{SDx}$; r not given $\quad \frac{cov(x,y)}{(SDx)^2}$

x on y: $\quad b_{xy} = r \cdot \frac{SDx}{SDy}$; $\quad \frac{cov(x,y)}{(SDy)^2}$

- Sacle no impact. only for magnitude sign.
- origin no impact.
- $b_{vu} = b_{yx} \times \frac{\Delta \text{ of scale of } y}{\Delta \text{ of scale of } x}$
- $b_{uv} = b_{xy} \times \frac{\Delta \text{ of scale of } x}{\Delta \text{ of scale of } y}$
- Two regression line will intersect at the points.
- GM is regression coefficient.
  $r_{xy} = \pm\sqrt{b_{xy} \times b_{yx}}$
- method of least sqare
- y on x - verticle distance
- x on y - horizontal
- Diff estimated and observed value is error
- Coefficient of determination $(r)^2$

non Determination $= 1-(r)^2$

* Index number

* Price/Quantity $= \frac{\text{Current Price}}{\text{Base Price}}$

* Link relative $= \frac{P_1}{P_0} \times \frac{P_2}{P_1} \times \frac{P_3}{P_2}$

* chain $= \frac{P_1}{P_0} \times \frac{P_2}{P_0}$ = Base fixed

* 11 direct not Available $= \frac{LRCY \times C\,Index\,PY}{100}$

* Limitations
- error due sampling
- not real picture
- many method at time is creates confusion
- shifted Price $= \frac{\text{orignal Price Index}}{\text{PI of the year on which it has to be shifted}} \times 100$

* simple Aggregative method

$\frac{\Sigma P_n}{\Sigma P_0} \times 100$

- easy to compute
- Unit of Price are chang Index will also change.

* for relative

$\frac{\sum \frac{P_n}{P_0}}{N}$ - Pure numbers

* Deflate value

$= \frac{\text{Current value}}{\text{Price index of the current Year}}$

maths of finance

$P = 1 + \left(\frac{rn}{100}\right)$

SI $\frac{PRN}{100}$ Amt As per SI = $A = P + SI$

$SI = A - P$

$A = P + \frac{PRN}{100}$

CI $A = P(1+r)^n$

$CI = A - P$

$CI = P(1+r)^n - P$

$CI = P(1+r)^n - 1$

ERI $= (1+r)^n - 1 \times 100$

Scrap value

$A = P(1-r)^n$

Rule 100 SI (Double) $N = \frac{100}{R}$ $R = \frac{100}{N}$

Rule 200 SI (Triple) $N = \frac{200}{R}$ $N = \frac{200}{R}$

* Annuity

Annuity due/imediate :- start at beings the period or today.

" regular = at the end of the period.

silent for take regular

* Future value

$FV = CF(1+r)^n$ single cash flow

$FV = \text{Annuity} \times \frac{(1+r)^n - 1}{r}$ $FV = \text{Annuity} \times FVAF(n, r)$

due = Annuity $\times \left(\frac{(1+r)^n - 1}{r}\right) \times (1+r)$ = Annuity $\times FVAF(n, r) \times (1+r)$

* Present value

$PV = \frac{CF}{(1+r)^n}$ single cash flow

take $\frac{1}{1.r\%}$ = Mt n year

PV = Annuity × PVIFA @ r% for n year

NPV = Real rate = nominal rate (−) inflaction

due = Annuity $\times \left(\frac{(1+r)^n - 1}{r \times (1+r)^n}\right)$

* SI & CI Diff

2 year = Pr^2

3 year = $P(r^3 + 3r^2)$

CI instrest

Rule = 72 (Double) $N = \frac{72}{R}$ $R = \frac{72}{N}$

Rule = 115 (Triple) = $N = \frac{115}{R}$ $R = \frac{115}{N}$

Sep 2023

Theoretical distribution

* Random variable : discrete & continuous :-

* discrete
1. Probability mass function

* continuous
1. Probability density fun.

* mass function :- 1. Binomial Dis.

μ = mean = np mean > variance

σ^2 = variance = npq positive < $\frac{1}{2}$ maximum value = $\frac{n}{4}$

SD = $\sqrt{npq}$ negative > $\frac{1}{2}$

mode = $(n+1)p$

$P(x) = nCx \cdot p^x \cdot q^{n-x}$ $x \sim B(n, p)$

integer	non-integer
two modes	one mode
$(n+1)p$	Largest value
$(n+1)p-1$	$(n+1)p$

* Poisson   mean = variance

np is finite denoted p and m

$m = np$ SD = $\sqrt{m}$ SD = $\sqrt{np}$

$p < \frac{1}{2}$ Positive

* $P(x) = \dfrac{e^{-m} m^x}{x!}$ $e = 2.7183$

normal curve = bell shaped

QD : MD : SD
10 : 12 : 15

$$\text{pdf} = \frac{1}{\sigma\sqrt{2\pi}} e^{-\left(\frac{x-\mu}{\sigma}\right)^2 \times \frac{1}{2}}$$

3 * normal distribution

mean = median = mode = 1

Bi-Parameter - μ, σ^2

mean Deviation = 0.8σ

Quartile " = 0.675σ

$Q_1 = \mu - 0.675\sigma$

$Q_3 = \mu + 0.675\sigma$

4. Standard normal distribution

$\mu = 0$ $\sigma = 1$

x to z $z = \dfrac{x-\mu}{\sigma}$

μ = mean = median = mode = 0

-1 to 1

mean = 0.8

Quartile = 0.675

* formation

$\mu \longrightarrow \mu+\sigma = 34.135\%$

$\mu+\sigma \longrightarrow \mu+2\sigma = 13.59\%$

$\mu+2\sigma \longrightarrow \mu+3\sigma = 2.14\%$

$\mu+3\sigma \longrightarrow \infty = 0.135\%$

50.000%

$\mu-\sigma \longrightarrow \mu+\sigma = 68.27\%$

$\mu-2\sigma \longrightarrow \mu+2\sigma = 95.45\%$

$\mu-3\sigma \longrightarrow \mu+3\sigma = 99.73\%$

HM Dis = $H = \frac{n}{\Sigma(\frac{1}{x})}$

Freq Dis = $H = \frac{n}{\Sigma(f/x)}$

$HM = \frac{n_1+n_2}{\frac{n_1}{H_1}+\frac{n_2}{H_2}}$

Relation same = AM = GM = HM
difference = AM > GM > HM
silent = AM ≥ GM ≥ HM

- non zero obser.
- reciprocal of AM
- all obs. constant HM also constant

* AM x GM x HM

GM x HM used calculating Average rate

GM = % rate give

HM = % rate give

Imp = $(GM)^2$ = AM x HM

* Weighted Average

$AM = \frac{\Sigma wx}{\Sigma w}$

$GM = (x_1^{w} \cdot x_2^{w} \times x_3^{w} \ldots x_n^{w})$

$HM = \frac{\Sigma w}{\Sigma(\frac{w}{x})}$

* The scatteredness of a set of obs.
* comparing two or more dist.

* Measure of Dispersion

Type

Absolute		Relative
Range	-	Coefficient of Range
mean Deviation	-	" of MD
Standard "	-	" of SD
Quartile "	-	" of QD

not usefull for comparision of two Variable with diff Units

- Usefull for com of two variable with diff Units

* range Dis = H - L

Coeff = $\frac{H-L}{H+L} \times 100$

Prop Value
- Not Affected origin & scale
- Scale Affected but only
- No impact of sign of chang of scale
- negative is never
- Not based All obs.
- easy to compute.

* mean Deviation

Dis = $\frac{1}{n} \Sigma|x-A|$

freq = MD = $\frac{1}{n} \Sigma f|x-A|$

coff = $\frac{\text{mean Dev. About A}}{A} \times 100$

- minimum value - Deviation taken medium
- origin not affected
- Scale (only sign)
- Based All obs.
- improvment over Range
- Difficult compute
- Not Amenable mathematical Pro.

* Probability

$P(A) = \dfrac{\text{favourable}}{\text{total}}$

Probability $= 0 \le P(A) \le 1$

$P(A) = 1$ sure

$P(A) = 0$ impossible

A is denoted $P(A')$ or $P(\bar{A})$

$P(\bar{A}) = 1 - P(A)$ – non accuarance

odds in favour $= \dfrac{\text{fav}}{\text{unfav}}$

aggainst $= \dfrac{\text{unfav}}{\text{fav}}$

* at Least = ઓછામાં ઓછું

$P(A) = \dfrac{n(A)}{n(S)}$

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

* excpected frequency of event - A

$P(A) \times N$ (no outcome total)

only (A) $= P(A-B)$ $P(A \cap B')$ $- P(A) - P(A \cap B)$

only (B) $= P(B-A)$ $(P)(A' \cap B)$ $- P(B) - P(A \cap B)$

formula — Applicable

$P(A \cup B) = P(A) + P(B)$ – mutually exclusive

$P(A_1) + P(A_2) + P(A_3)$ – Any no. mut. exc. event

$(A \cup B) = P(A) + P(B) - P(A \cap B)$ – for two event

* A is Accured — B - Accured

$P(B|A) = \dfrac{P(B \cap A)}{P(A)}$ $\quad \dfrac{P(A \cap B)}{P(B)}$

* Dependent

$P(A \cap B) = P\left(\frac{A}{B}\right) \times P(B)$

$P(B \cap A) = P(B|A) \times P(A)$

* Independent

$P(A \cap B) = P(A) \times P(B)$

$P(A' \cap B) = P(A') \times P(B)$

$P(A \cap B') = P(A) \times P(B')$

$P(A' \cap B') = P(A') \times P(B')$

* Demorgem

$P(A \cup B \cup C) = 1 - P(A \cup B \cup C)'$

$P(A \cup B \cup C) = 1 - P(A' \cap B' \cap C')$

$P(A \cup B \cup C) = 1 - P(A') \times P(B') \times P(C')$

* excpected value

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

* variance

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

$\sigma^2 = \Sigma px^2 - (\Sigma px)^2$

* central tendency & Dispersion

AM Formula

* Discrete obs. $= \bar{x} = \dfrac{x_1 + x_2 + x_3 \ldots n}{n}$

$\bar{x} = \dfrac{\Sigma fx}{n}$ $\qquad \bar{x} = \dfrac{\Sigma x}{n}$

* freq. Dis $= \longrightarrow$

* mean method $= \bar{x} = A + \dfrac{\Sigma fd}{n} \times C$

$d = \dfrac{x - A}{C}$

Properties

(+, −) (× ÷)

- Constant, due origin and scale
- deviation set ob. AM is zero.
- $\bar{x}_c = \dfrac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$
- Best measure, based All obs.
- Affected sampling fluctions
- amenable mathematical property.
- can't use open ended classification.

Median

n = even (जोड़ी) averag two mid.

* Dis ob n = odd (बेजोड़ी) the middle term

* grouped frequ Dist. - Prepare less than cf find - $\frac{n}{2}$ and identify median class

$Me = l + \dfrac{(n/2 - cf)}{f} \times C$

med class. → f

↳ upper of me freq.

- affected origin and scale
- absolute deviation is minimum
- taken for median
- Positive Average - not Aff sampling.
- Best measure open ended class.

Median - 2|1 (M) Quartile - 4|3 punt (Q)

Decile - 10|9 (D) Perntile - 100|99 punt (P)

Mode

$Mo = l + \dfrac{f_1 - f_0}{2f_1 - f_0 - f_2} \times C$

f_1 = freq modal

f_0 = Pre 〃

f_2 = Post 〃

mean - mode = 3 (mean - median)

mode = 3 median - 2mean

symetric distri = mean = median = mode

- maximum numbers - same freq - no m.
- two or more obs. are having maxi freq there are multipul mode
- two mode - Binomodal distribution
- not regidly define
- All ob constant mode Also constant
- Affcted change or origin
- amenable mathematical property
- not based All obs.

* Geometric mean

- dis $= G = (x_1 \times x_2 \times x_3)^{\frac{1}{n}}$
- freq $= G = (x_1^{f_1} \times x_2^{f_2} \times x_3^{f_3})^{\frac{1}{N}}$
- Positive = n^{th} of all ob. roots
- G set AM log = $\log G = \frac{1}{n} \Sigma \log x$
- All ob constant = GM constant

$z = xy$ GM of z = GM of x × GM of y

$= \dfrac{x}{y}$ GM of z = $\dfrac{\text{GM of } x}{\text{GM of } y}$

IMP Data

GM/HM ratio | other

Percent → GM

other than Percent → HM