CHAPTER 1 – RATIO, PROPORTION AND VARIATION

Meaning of Ratio

Division of two quantities a and b of same units. Denoted by a:b

Inverse Ratio

b:a is inverse ratio of a:b

Compound Ratio

Compound ratio of a:b and c:d is ac:bd

Duplicate Ratio

Duplicate ratio of a:b is a^2:b^2

Sub-duplicate Ratio

Sub-Duplicate ratio of a:b is $\sqrt[2]{a}:\sqrt[2]{b}$

Triplicate Ratio

Triplicate ratio of a:b is a^3:b^3

Sub-triplicate Ratio

Sub-Triplicate ratio of a:b is $\sqrt[3]{a}:\sqrt[3]{b}$

Commensurate

If ratio can be expressed in the form of integers

Incommensurate

If ratio cannot be expressed in the form of integers

Continued Ratio

Ratio of three or more quantities e.g. a:b:c

Meaning of Proportion

a,b,c,d are in proportion if a:b = c:d [it is an equality of two ratios]

Term/ Proportional

first = a, second = b, third =c, fourth = d

Mean Proportional

In a continued proportion a:b=b:c, b^2=ac, b is called mean proportion.

Cross Product Rule

If a:b=c:d, then ad = bc

Invertendo

If a:b=c:d, then b:a = d:c

Alternendo

If a:b=c:d, then a:c = b:d

Componendo

If a:b=c:d, then (a+b):b = (c+d):d

Dividendo

If a:b=c:d, then (a–b):b = (c–d):d

Componendo and dividendo

If a:b=c:d, then (a+b):(a–b) = (c+d):(c–d) or (a–b):(a+b) = (c–d):(c+d)

Addendo

If a:b = c:d = e:f = ……. = k, then also (a+c+e+……):(b+d+f+….) = k

Preview from Notesale.co.uk
Page 1 of 37

(d) {{1, 2, 3}, {1, 2}, {1, 3}, {2, 3}, {1}, {2}, {3}}

5. A set containing 4 elements have –

(a)15 subsets (b) 14 subsets

(c)16 subsets (d) 13 subsets

6. A ∪ A is equal to

(a)A (c) φ

(b)E (d) none of these

7. A ∪ A` is equal to

(a)A (c) φ

(b)Sample space (d) none of these

8. A ∪ E is equal to

(a)A (c) φ

(b)E (d) none of these

9. If A = (1, 2, 3, 5, 7) and B = (1, 3, 6, 10, 15) then cardinal number of A – B is

(a)3 (c) 6

(b)-4 (d) none of these

10. The range set of a constant function is a –

(a) Disjoint set (c) void set

(b) Singleton set (d) infinite set

Preview from Notesale.co.uk
Page 12 of 37

CHAPTER 4 – SIMPLE INTEREST & COMPOUND INTEREST

Interest

Interest is the additional money which is paid by the borrower to the lender on the principal borrowed. The additional money (or) interest is paid for the use of money by the borrower. Interest is usually denoted by I.

SIMPLE INTEREST	COMPOUND INTEREST
Formula: $S.I. = \frac{PRT}{100}$ $A = P + S.I.$ P = Principal (Amount invested) R = Rate of interest T = Time of investment	**Formula:** $C.I. = P(1+ R/100)^n - P$ $A = P(1+ R/100)^n$ P = Principal (Amount invested) R = Rate of interest T = Time of investment

Effective Rate of Interest

Formula: $E = [(1 + i)^n - 1]$

Period Duration	No. of compounding
Yearly	1
Half yearly	2
Quarterly	4
Monthly	12
Daily	365

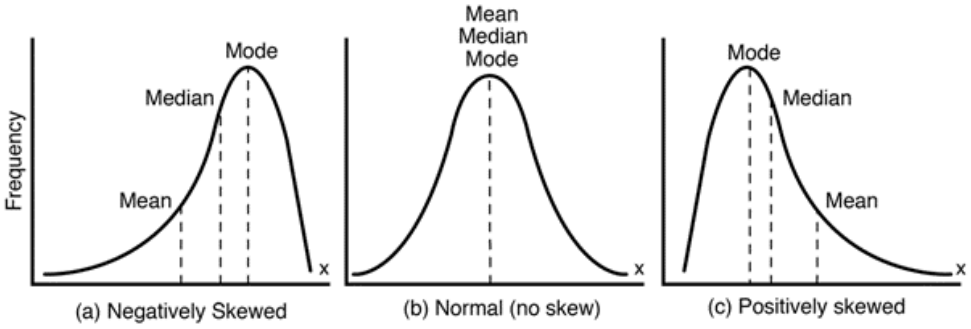
Preview from Notesale.co.uk
Page 13 of 37

Here n = number of compounding in one year.

i = Interest rate according to number of compounding.

i.e. R/number of compounding.

Higher the compounding for a rate of interest Higher the effective rate.

	Best Measure – Overall SD	Standard deviation
	Best Measure for Open End Class	Quartile deviation
	Quickest to compute	Range
	Not based on all observations	Range
	Difficult to comprehend and less Mathematical	Mean deviation
	Rigidly defined	Mean deviation, S.D., Q.D.
	Not affected by Sampling fluctuations	Quartile deviation
	Graphical calculation of dispersion	Lorenz curve
Meaning of Skewness	skewness is the measure of how much the probability distribution of a random variable deviates from the normal distribution.	
Graphical representation of skewness	 (a) Negatively Skewed (b) Normal (no skew) (c) Positively skewed Mode>median>mean mean=median=mode mean>median>mode	
Coefficient of skewness	$Q_3+Q_1 < 2Q_2$ (positively skewed) $Q_3+Q_1 > 2Q_2$ (negatively skewed) $Q_3+Q_1 = 2Q_2$ (No skewness)	
Absolute measures of skewness	Absolute skewness SK = $\bar{X}$ – Mode Absolute skewness SK = $\bar{X}$ – Median Absolute skewness SK = Median – Mode	
Relative measures of skewness	(a) The Karl Pearson's Coefficient of skewness = $\frac{\bar{X}-Z}{\sigma}$ OR, = $\frac{3(\bar{X}-M)}{\sigma}$ (b) The Bowley's Coefficient of skewness = $\frac{Q_3+Q_1-2M}{Q_3-Q_1}$ (c) The Kelly's Coefficient of skewness = $\frac{P_{10}+P_{90}-2M}{P_{90}-P_{10}}$ (d) Measure of skewness Based on Moments.	

Preview from Notesale.co.uk
Page 31 of 37

<table>
<tr><td></td><td colspan="3">

Change of Origin No impact
Change of Scale No impact
Effected by sign of scale
Direction as well as strength of correlation.
Best Method – Most accurate

</td></tr>
<tr><td rowspan="3">Spearmen Rank correlation</td><td>When ranks are given</td><td>When ranks are not given</td><td rowspan="2">When ranks are repeated</td></tr>
<tr><td>$r_k = 1 - 6\frac{\sum D^2}{N^3-N}$</td><td>Firstly find out the ranks according to the marks given.</td></tr>
<tr><td colspan="3">$r_k = 1 - \frac{6(\sum D^2 + \frac{1}{12}(m_1^3-m_1) + \frac{1}{12}(m_2^3-m_2) + \cdots + \frac{1}{12}(m_n^3-m_n)}{N^3-N}$</td></tr>
<tr><td>Properties</td><td colspan="3">

Useful for attributes.
Best measure for qualitative data.

</td></tr>
<tr><td>Coefficient of concurrent deviations</td><td colspan="3">A very simple and casual method of finding correlation when we are not serious about the magnitude of the two variables is the application of concurrent deviations.</td></tr>
<tr><td>Formula</td><td colspan="3">$r_c = \pm\sqrt{\pm\frac{(2c-m)}{m}}$ m = N - 1
c = No. of positive signs in the product of deviation column.
If (2c-m) > 0, we take the positive sign both inside and outside
if (2c-m) < 0, we are to consider the negative sign both inside and outside</td></tr>
<tr><td>Practice question (concurrent deviation)</td><td colspan="3">
<table>
<tr><td>Year :</td><td>1990</td><td>1991</td><td>1992</td><td>1993</td><td>1994</td><td>1995</td><td>1996</td><td>1997</td></tr>
<tr><td>Price :</td><td>25</td><td>28</td><td>30</td><td>23</td><td>35</td><td>38</td><td>39</td><td>42</td></tr>
<tr><td>Demand :</td><td>35</td><td>34</td><td>35</td><td>30</td><td>29</td><td>28</td><td>26</td><td>23</td></tr>
</table>
</td></tr>
<tr><td>Equations based questions</td><td colspan="3">Correlation is not effected by origin as well as scale but it does effected by the sign of scale.
y = a+bx
u = a+vx
The correlation is effected by sign of "b" and "d"
$r_{uv} = r_{xy} \times$ sign of scale of x and y</td></tr>
<tr><td>Coefficient of determination and non-determination</td><td colspan="3">Coefficient of determination = r^2
Coefficient of non determination = $1 - r^2$
Here r = correlation.</td></tr>
<tr><td>Probable error</td><td colspan="3">Probable error = $0.6745 \times \frac{(1-r^2)}{\sqrt{n}}$ standard error = $\frac{1-r^2}{\sqrt{n}}$
r < 6 x probable error (not significant)
r ≥ 6 x probable error (significant) n = No. of items
Probable error = $\frac{2}{3}$ of standard error</td></tr>
</table>

Preview from Notesale.co.uk
Page 33 of 37

Cyclic Order	If two variables shows a linear relationship then being a straight line we need to find out whether it is increasing or decreasing. r = 1 (scale is greater than 0 and it is increasing) r = -1 (scale is less than 0 and it is decreasing) $r_{xy} \times r_{xu} = r_{uy}$	
Meaning of Regression	Estimation of one variable for a given value of another variable on the basis of an average mathematical relationship between the two variables.	
Regression Equations	X on Y (x depends on y)	Y on X (y depends on x)
	$X-\bar{X} = b_{xy} (Y-\bar{Y})$ b_{xy} = Regression coefficient x on y y = a+bx here, b = regression coefficients a and b = regression parameters $b_{xy} = \frac{N\sum XY-\sum X\sum Y}{N\sum Y^2-(\sum Y)^2}$ $b_{xy} = r \times \frac{S.D.of\ X}{S.D\ of\ Y}$ $b_{xy} = \frac{Cov(x,y)}{(S.D.of\ Y)^2}$	$(Y-\bar{Y}) = b_{yx}\ X-\bar{X}$ b_{yx} = Regression coefficient y on x x = a+by here, b = regression coefficients a and b = regression parameters $b_{yx} = \frac{N\sum XY-\sum X\sum Y}{N\sum X^2-(\sum X)^2}$ $b_{yx} = r \times \frac{S.D.of\ Y}{S.D\ of\ X}$ $b_{yx} = \frac{Cov(x,y)}{(S.D.of\ X)^2}$
Properties of regression	✦ Regression is not effected by origin (+, -) but it does effected by scale(×,÷) $b_{uv} = b_{xy} \times \frac{My}{Mx}$ $b_{uv} = b_{yx} \times \frac{Mx}{My}$ ✦ The intersection points of regression lines are their means. ✦ If the two regression lines are coinciding and identical then r = ± 1 ✦ When the regression lines are perpendicular then r = 0	
Relationship between correlation and regression	$r = \pm\sqrt{\pm b_{xy} \times \pm b_{yx}}$ The sign of b_{xy}, b_{yx} and r is going to be same in 100% cases.	

Preview from Notesale.co.uk
Page 34 of 37