Appendix-1

Year	GDP (x)	VAT (y)	X^2	X xY	Y^2
2001/02	4,044.82	119.48	16,360,568.83	483,275.09	14,275.47
2002/03	4,689.20	134.49	21,988,596.64	630,650.51	18,087.56
2003/04	4,724.24	144.48	22,318,443.58	682,558.20	20,874.47
2004/05	5,041.01	188.94	25,411,781.82	952,448.43	35,698.32
2005/06	5,829.50	219.46	33,983,070.25	1,279,342.07	48,162.69
2006/07	6,705.88	267.04	44,968,826.57	1,790,738.20	71,310.36
2007/08	8,208.14	298.16	67,373,562.26	2,447,339.02	88,899.39
2008/09	9,600.12	397.00	92,162,304.01	3,811,247.64	157,609.00
TOTAL	**48842.91**	**1769.05**	**324567154**	**12077599.15**	**454,917.26**

$N = 8$

$$\text{Correlation Coefficiet(r)} = \frac{N\sum XY - \sum X.\sum Y}{\sqrt{N.\sum X^2 - (\sum X)^2}\sqrt{N.\sum y^2 - (\sum Y)^2}}$$

$$= \frac{8\times 12077599.2 - 48842.91\times 1769.05}{\sqrt{8\times 324567154 - (48842.9)^2}\sqrt{8\times 454917.26 - (1769.05)^2}}$$

$$= \frac{96620793.6 - 86405549.96}{\sqrt{2596537232 - 2385628880.41^*}\sqrt{3639338.08 - 3129537.9}}$$

$$= \frac{10215243.64}{\sqrt{210908351.59}\sqrt{509800.17}}$$

$$= \frac{10215243.64}{14522.68\times 714}$$

$$= \frac{10215243.64}{10369235.93}$$

$$= 0.99$$

$$\overline{X} = \frac{\sum X}{N} = \frac{4884291}{8} = 6105.36 \; similarly, \; \overline{Y} = \frac{\sum Y}{N} = \frac{1769.05}{8} = 221.13$$

$$\pm_1 = \sqrt{\frac{\sum X^2}{N} - \left(\frac{\sum X}{N}\right)^2} = \sqrt{\frac{324567154}{8} - \left(\frac{48842.91}{8}\right)^2} = \sqrt{329542.73} = 1815.33$$

$$\pm_2 = \sqrt{\frac{\sum Y}{N} - \left(\frac{\sum Y}{N}\right)^2} = \sqrt{\frac{454917.26}{8} - \left(\frac{1769.05}{8}\right)^2} = \sqrt{7965.62} = 89.25$$

$$CV_1 = \frac{\pm_1}{\overline{X}} \times 100\% = \frac{1815.33}{6105.36} \times 100\% = 29.73\%$$

$$CV_2 = \frac{\pm_2}{\overline{Y}} \times 100\% = \frac{89.25}{221.13} \times 100\% = 40.36\%$$

Null Hypothesis, H_0 : «$_1$ = «$_2$ *i.e* there is no significant difference between GDP and VAT. In other word, there is no signicant increasement in the VAT.

Alternative Hypothesis, H_1 : «$_1$ < «$_2$ i.e there is significant difference between GDP and VAT. In other word, there is increasement in the VAT.

$\overline{X} = 6105.36$

$\overline{Y} = 221.13$

$$S^2p = \frac{1}{n_1 + n_2 - 2}\left\{\sum X^2 - \frac{(\sum X)^2}{n_1} + \sum Y^2 - \frac{(\sum Y)^2}{n_2}\right\}$$

$$= \frac{1}{8+8-2}\left\{324567154 - \frac{(4884.91)^2}{8} + 454917.26 - \frac{(1769.05)^2}{8}\right\}$$

$$= \frac{1}{16}\{2636342.184 + 63725.02\}$$

$$= 165169.668$$

$$t = \frac{\bar{X} - \bar{Y}}{\sqrt{S^2 p\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$= \frac{6105.36 - 221.13}{\sqrt{165169.668\left(\frac{1}{8} + \frac{1}{8}\right)}}$$

$$= \frac{5884.23}{\sqrt{41292.417}}$$

$$= 9.157$$

$\text{Degree of Freedom}(df) = n_1 + n_2 - 2 = 8 + 8 - 2 = 14$

$\text{Level of Significance}(\sim) = 0.05$

Critical Value : The tabulated value of $|t|$ at 5% level of significance for the left tailed test and for 14df is 1.76

Decision : Since, the calculated value of $|t|$ is greater than tabulated value of t, the alternative hypothesis is accepted and that reprsents the increment in the VAT collection

Appendix-2

Year	TR(X)	VAT(Y)	X xY	X^2	Y^2
2000/01	488.93	120.50	58,916.07	239,052.54	14,520.25
2001/02	504.45	119.47	60,266.64	254,469.80	14,273.08
2002/03	562.29	134.49	75,622.38	316,170.04	18,087.56
2003/04	623.31	144.48	90,055.83	388,515.36	20,874.47
2004/05	701.22	188.94	132,488.51	491,709.49	35,698.32
2005/06	722.82	219.46	158,630.08	522,468.75	48,162.69
2006/07	877.12	267.04	234,226.12	769,339.49	71,310.36
2007/08	1,076.22	298.15	320,874.99	1,158,249.49	88,893.42
2008/09	1,434.74	397.01	569,606.13	2,058,478.87	157,616.94
TOTAL	**6991.1**	**1889.54**	**1,700,686.75**	**6,198,453.84**	**469,437.10**

$$r = \frac{N\sum XY - \sum X \cdot \sum Y}{\sqrt{N \cdot \sum X^2 - \left(\sum X\right)^2}\sqrt{N \cdot \sum Y^2 - \left(\sum Y\right)^2}}$$

$$= \frac{9 \times 1700686.75 - 6991.10 \times 1889.54}{\sqrt{9 \times 6198453.84 - (6991.10)^2}\sqrt{9 \times 469437.10 - (1889.54)^2}}$$

$$= \frac{209621.66}{\sqrt{691060.35}\sqrt{65457.248}}$$

$$= \frac{209621.66}{212684.782}$$

$$= 0.98$$

$$\text{Coefficient of determination } (r^2) = (0.98)^2 = 0.96$$

S^2P

$$V_x = \frac{\pm_x}{\pm_y} \times 100\% = \frac{292.09}{90.01} \times 100\% = 37.60\%$$

$$CV_Y = \frac{\pm_x}{\pm_y} \times 100\% = \frac{90.01}{209.09} \times 100\% = 43.05\%$$

$$\overline{X} = \frac{6991.1}{9} = 776.78$$

$$\overline{Y} = \frac{1889.54}{9} = 209.9$$

$$\pm_x = \sqrt{\frac{\sum X^2}{n} - \left(\overline{X}\right)^2} \; or$$

$$= \sqrt{\frac{6198453.84}{9} - (776.78)^2}$$

$$= \sqrt{85316.11}$$

$$= 292.09$$

$$\pm_y = \sqrt{\frac{\sum y^2}{n} - \left(\bar{y}\right)^2}$$

$$= \sqrt{\frac{469437.10}{9} - (209.9)^2}$$

$$= \sqrt{8101.66}$$

$$= 90.01$$

$$CV_x = \frac{\pm_x}{\pm_y} \times 100\% = \frac{292.09}{90.01} \times 100\% = 37.60\%$$

$$CV_Y = \frac{\pm_x}{\pm_y} \times 100\% = \frac{90.01}{209.09} \times 100\% = 43.05\%$$

$$\boxed{S^2P} = \frac{1}{n_1 + n_2 - 2}\left\{\sum X^2 - \frac{\left(\sum X\right)^2}{n_1} + \sum Y^2 - \frac{\left(\sum Y\right)^2}{n_2}\right\}$$

$$= \frac{1}{9+9-2}\left\{6198453.84 - \frac{(6991.1)^2}{9} + 469437.10 - \frac{(1889.54)^2}{9}\right\}$$

$$= \frac{840667.68}{16}$$

$$= 52541.73$$

$$|t| = \frac{\overline{X}}{\sqrt{S^2 p\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{776.78 - 209.9}{\sqrt{52541.73 \times 0.223}} = \frac{133.12}{108.24} = 1.23$$

Appendix-3

Year	TTR(X)	Y	X*Y	X^2	Y^2
2000/01	388.65	120.50	46,832.33	151,048.82	14,520.25
2001/02	393.30	119.47	46,987.55	154,684.89	14,273.08

2002/03	425.86	134.49	57,273.91	181,356.74	18,087.56
2003/04	481.73	144.48	69,600.35	232,063.79	20,874.47
2004/05	541.04	188.94	102,224.10	292,724.28	35,698.32
2005/06	574.30	219.46	126,035.88	329,820.49	48,162.69
2006/07	711.26	267.04	189,934.87	505,890.79	71,310.36
2007/08	851.29	298.15	253,812.11	724,694.66	88,893.42
2008/09	680.80	397.01	270,284.41	463,488.64	157,616.94
TOTAL	**5,048.23**	**1,889.54**	**1,162,985.51**	**3,035,773.11**	**469,437.10**

$$\overline{X} = \frac{5048.23}{9} = 560.91 \ldots\ldots\ldots\ldots \overline{Y} = \frac{1889.54}{9} = 209.9$$

$$\pm_x = \sqrt{\frac{\sum X^2}{n} - \left(\overline{X}\right)^2} = \sqrt{\frac{303577311}{9} - (560.91)^2} = \sqrt{22699.31} = 150.66$$

$$\pm_Y = \sqrt{\frac{\sum Y^2}{n} - \left(\overline{Y}\right)^2} = \sqrt{\frac{469437.10}{n} - (209.9)^2} = \sqrt{8101.66} = 90.01$$

$$CV_X = \frac{\pm_x}{\overline{X}} \times 100\% = \frac{150.66}{560.9} \times 100\% = 26.86\%$$

$$CV_Y = \frac{\pm_Y}{\overline{Y}} \times 100\% = \frac{90.01}{209.9} \times 100\% = 42.88\%$$

$$r = \frac{N \cdot \sum XY - \sum X \cdot \sum Y}{\sqrt{N \cdot \sum X^2 - \left(\sum X\right)^2}\sqrt{N \cdot \sum Y^2 - \left(\sum Y\right)^2}}$$

$$= \frac{9 \times 116298551 - 5048.23 \times 1889.54}{\sqrt{9 \times 303577311 - (5048.23)^2}\sqrt{9 \times 469437.10 - (1889.54)^2}} = \frac{928037.07}{109665995} = 0.85$$

Coefficient of determination$(r)^2 = (0.85)^2 = 0.72$

NOTE : –By calculator

$$S^2p = \frac{1}{n_1 + n_2 - 2}\left\{\sum X^2 - \overline{X} \cdot \sum X + \sum Y^2 - \overline{Y} \cdot \sum Y\right\}$$

$$= \frac{1}{\quad}\{303573311 - 283162512 + 469437.10 - 39661444\}$$

$$9+9-2$$

$$=\frac{1}{16}\times 27687.26$$

$$=1730 4.89$$

$$t=\frac{\overline{X}-\overline{Y}}{\sqrt{S^2p\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}=\frac{560.91-209.90}{\sqrt{17304.89\times 0.223}}=\frac{351.01}{62.01}=5.66$$

Null Hypothesis, $\alpha_1 = \alpha_2$ i.e, There is no significant difference between Total Tax Reveue and VAT collection

Alternative Hypothesis, $\alpha_1 < \alpha_2$ i.e There is significant difference between Total Tax Revenue and VAT collection

Degree of freedom $= n_1 + n_2 - 2$

Level of Significant$(\sim) = 0.05$

Critical Value :- The tabulated value of $|t|$ at $\sim$ 5% level of significant for left tail test and for 16 d.f is 1.746

Decision:- Since the calculated value of $|t|$ is greater than the tabulated value therefore Alternative hypothesis should be accepted. There is significant difference between TTR and VAT.

Appendix-4

Year	Ind. Tax Rev (X)	VAT (Y)	X x Y	X^2	Y^2
2000/01	287.05	120.50	34,589.53	82,397.70	14,520.25
2001/02	287.33	119.47	34,327.32	82,558.53	14,273.08
2002/03	324.81	134.49	43,683.70	105,501.54	18,087.56
2003/04	362.60	144.48	52,388.45	131,478.76	20,874.47

2004/05	410.32	188.94	77,525.86	168,362.50	35,698.32
2005/06	434.62	219.46	95,381.71	188,894.54	48,162.69
2006/07	521.46	267.04	139,250.68	271,920.53	71,310.36
2007/08	828.20	298.15	246,927.83	685,915.24	88,893.42
2008/09	646.48	397.01	256,659.02	417,936.39	157,616.94
TOTAL	**4,102.87**	**1,889.54**	**980,734.08**	**2,134,965.74**	**469,437.10**

$$\overline{X} = \frac{\sum X}{n} = \frac{4102.87}{9} = 455.87 \ldots\ldots\ldots\ldots\ldots \overline{Y} = \frac{\sum X}{n} = \frac{1889.54}{9} = 209.9$$

$$\pm_x = \sqrt{\frac{\sum X^2}{n} - \left(\overline{X}\right)^2}$$

$$= \sqrt{\frac{2134965.736}{9} - (455.87)^2} = \sqrt{23721842 - 207817.46} = \sqrt{29400.95} = 171.4$$

$$CV = \frac{\pm_x}{\overline{X}} \times 100\% = \frac{171.46}{455.87} \times 100 = 37.61\%$$

$$\pm_Y = \sqrt{\frac{\sum Y^2}{n} - \left(\overline{Y}\right)} = \sqrt{23721842 - 44078.53} = \sqrt{8081.14} = 89.89$$

$$CV = \frac{\pm_Y}{\overline{Y}} \times 100\% = \frac{89.89}{209.9} \times 100\% = 42.82\%$$

$$S^2p = \frac{1}{n_1 + n_2 - 2}\left\{\sum X^2 - \sum X \cdot \overline{X} + \sum Y^2 - \sum Y \cdot \overline{Y}\right\}$$

$$= \frac{1}{9+9-2}\{213496574 - 455.87 \times 4102.87 + 469437.11 - 209.9 \times 1889.54\}$$

$$\frac{1}{16} \times 66127898$$

$$= 41329.9$$

$$t = \frac{\overline{X} - \overline{Y}}{\sqrt{S^2 p\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{455.87 - 209.9}{\sqrt{41329.9 \times 0.223}} = \frac{245.97}{\sqrt{917.24}} = \frac{247.97}{95.78} = 2.5$$

Null Hypothesis, $\alpha_1 = \alpha_2$ i.e, There is no significant differencebetween Total Reveue and VAT collection

Alternative Hypothesis, $\alpha_1 < \alpha_2$ i.e There is significant differencebetween Total Revenue and VAT collecti

Degree of freedom $= n_1 + n_2 - 2$

Level of Significant$(\sim) = 0.05$

Critical Value :- The tabulated value of $|t|$ at $\sim$ 5% level of significant for left tail test and for 16 d.f is 1.746

Decision:- Since the calculated value of $|t|$ is less than the tabulated value of $|t|$ therefore, Null hypothesis sho be accepted. There is no significant differencebetween TR and VAT.

Appendix-5

Year	VAT/TR(X)	VAT/TTR(Y)	X2	Y2	X*Y
2000/01	24.65	31.00	607.62	961.00	764.15
2001/02	23.68	30.38	560.74	922.94	719.40
2002/03	23.92	31.58	572.17	997.30	755.39
2003/04	23.18	29.99	537.31	899.40	695.17
2004/05	26.95	34.92	726.30	1,219.41	941.09
2005/06	30.36	38.21	921.73	1,460.00	1,160.06

2006/07	31.00	37.54	961.00	1,409.25	1,163.74
2007/08	27.70	35.02	767.29	1,226.40	970.05
2008/09	27.67	58.31	765.63	3,400.06	1,613.44
TOTAL	**239.11**	**326.95**	**6,419.79**	**12,495.76**	**8,782.49**

$$\overline{X} = \frac{31.03}{9} = 26.57 \ldots\ldots\ldots\ldots\ldots\ldots \overline{Y} = \frac{239.11}{9} = 36.33$$

$$S^2P = \frac{1}{n_1 + n_2 - 2}\left(\sum X^2 - \overline{X} \cdot \sum X + \sum Y^2 - \overline{Y} \cdot \sum Y\right)$$

$$= \frac{1}{9+9-2}(962.86 - 3.45 \times 31.03 + 641.979 - 26.57 \times 239.11)$$

$$= \frac{1}{16}(855.81 + 66.54)$$

$$= 44.57$$

$$t = \frac{\overline{X} + \overline{Y}}{\sqrt{S^2P\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{3.45 + 26.57}{\sqrt{57.65 \times 0.23}} = \frac{30.02}{\sqrt{12.86}} = \frac{30.02}{3.58} = 3.05$$

Null Hypothesis , H_0 «$_1$ = «$_2$, i.e, There is no significant difference between VAT/GDP and VAT/TR.

Alternative Hypothesis , H_1 , «$_1$ < «$_2$, i.e, there is significant difference between VAT/GDP and VAT/TR..

Degree of freedom : - $n_1 + n_2 - 2 = 9 + 9 - 2 = 16$

Level of significant $t(\sim) = 0.05$

Critical Value : - The tabulated value of $|t|$ at ~ 5% level of significant for left tailed test and for 16 d.f is 1.746.

Decision : - Since the calculated value of $|t|$ is greater than the tabulated value of t therefore the Alternative Hypothesis should be accepted. Here, the calculation represents the increment in the VAT/GDP and VAT/TR.

Appendix-6

Year	VAT/GDP(X)	VAT/TR(Y)	X^2	Y^2	X*Y
2000/01	2.78	24.65	7.73	607.62	68.53
2001/02	2.92	23.68	8.53	560.74	69.15
2002/03	2.89	23.92	8.35	572.17	69.13
2003/04	3.44	23.18	11.83	537.31	79.74
2004/05	3.64	26.95	13.25	726.30	98.10
2005/06	3.98	30.36	15.84	921.73	120.83
2006/07	3.63	31.00	13.18	961.00	112.53

2007/08	4.13	27.70	17.06	767.29	114.40
2008/09	3.62	27.67	13.10	765.63	100.17
TOTAL	**31.03**	**239.11**	**962.86**	**6,419.79**	**832.57**

$$\overline{X} = \frac{31.05}{9} = 3.45 \ldots\ldots\ldots similarly \ldots\ldots\ldots \overline{Y} = \frac{239.11}{9} = 26.57$$

$$s^2 p = \sum x^2 - \overline{x} \cdot \sum x + \sum y^2 - \overline{y} \cdot \sum y$$
$$= 1962.86 - 3.45 \times 31.03 + 6419.79 - 26.57 \times 239.11$$
$$= 962..86 - 107.05 + 6419.79 - 6353.15$$
$$= 855.81 + 66.64$$
$$= 57.65$$

$$t = \frac{\overline{X} + \overline{Y}}{\sqrt{s^2 p\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$
$$= \frac{3.45 + 26.57}{\sqrt{57.65 \times 0.223}}$$
$$= \frac{30.02}{\sqrt{12.86}}$$
$$= \frac{30.02}{3.58}$$
$$= 8.38$$

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