

APPENDIX 5. Details of Calculations of -

III Prediction of PSCE Mathematics (y_d) from SSCE Mathematics (x_1) and SSCE Mathematics (x_2)

N	x_1	x_2	x_1^2	x_2^2	$x_1 x_2$	y_d
1	15999	18758	1320592	933211	1083758	12038
x_1	953211	1083758	77087772	56072195	64277000	707966
x_2	1320592		96530570	64277000	77087772	357995
x_1^2			7293833128	4619816878	5695349842	66535459
x_2^2			3441409147		3902891040	42552560
$x_1 x_2$					4619816878	50974387
278	15999	18758	1320592	933211	1083758	12038
1	57.1906474820	67.4748201439	4750.3309352518	3356.8741007194	3898.4100719424	45.3021582754
23956.89668	10975.85433	1562260.48045	2701253.67268	2295.79.26620	19504.98561	
1	4595320785	65.2857922454	112.8499553863	95.9263179694	8.48502576	
	49866.55152	6707515.79044	70144.15780	2308524.47748	36789.45352	
	1	134.5093168865	1.4066374245	58.3281602983	7377581244	
		16398565.25350	1021291.85777	4052153.97019	127442.60114	
		1	.0622793422	.2471041770	.0077715732	
		374.1392.61727	1376954.76779	3690636679	-18284.13885	
		1	3468713.98541		-0048816549	
					3727.75801	
					.0010746801	

$$(1) \quad \therefore b_{x_1 x_2} = .0010746801$$

$$b_{x_1^2} + b_{x_1 x_2} (.3690336679) = -.00493816549$$

$$\therefore b_{x_1^2} = -.0052771734$$

$$b_{x_2^2} + b_{x_2} (.0622793422) + b_{x_1 x_2} (.2471041770) = .0077715702$$

$$\therefore b_{x_2^2} = .0078546711$$

$$b_{x_2} + b_{x_2^2} (134.5093168865) + b_{x_1^2} (1.4066374245) + b_{x_1 x_2} (58.3281602983) = .7377581244$$

$$\therefore b_{x_2} = -.3713370280$$

$$b_{x_1} + b_{x_1^2} (.4595320785) + b_{x_2} (65.2857922454) + b_{x_2^2} (112.8499553863) + b_{x_1 x_2} (35.9263179694) = .8148502576$$

$$\therefore b_{x_1} = .9662175811$$

$$c + b_{x_1} (57.1906474820) + b_{x_2} (67.4748201439) + b_{x_2^2} (4750.3309352518) + b_{x_1^2} (3356.8741007194) + b_{x_1 x_2} (3898.4100719424) = 43.3021582754$$

$$c = -10.5925691238$$

$$(ii) \quad \dots b_{x_2} = -.0048816549$$

$$b_{x_2} + b_{x_1} (.0622793422) = .0077715702$$

$$\dots b_{x_2} = .0080755965$$

$$b_{x_2} + b_{x_2} (134.5093168865) + b_{x_2} (1.4036374245) = .7377581244$$

$$\dots b_{x_2} = -.3416181258$$

$$b_{x_1} + b_{x_2} (.4585320785) + b_{x_2} (65.2657922454) + b_{x_1} (112.8489553863) = .8148502576$$

$$\dots b_{x_1} = .9953225796$$

$$c + b_{x_1} (57.1906474820) + b_{x_2} (67.4748201439) + b_{x_2} (4750.3309352518) + b_{x_1} (3356.8741007194) = 43.3021582734$$

$$\dots c = -12.5450178832$$

$$y_d = -.0048816549x_1^2 + .0080755965x_2^2 + .9953225796x_1 - .3416181258x_2 - 12.5450178832$$

$$(iii) \quad b_{x_2} = .0077715702$$

$$b_{x_2} + b_{x_2} (134.5093168865) = .7377581244$$

$$b_{x_2} = -.3075904743$$

$$b_{x_1} + b_{x_2} (.4585320785) + b_{x_2} (65.2657922454) = .8148502576$$

$$b_{x_1} = .4486726710$$

$$c + b_{x_1} (57.1906474820) + b_{x_2} (67.4748201439) + b_{x_2} (4750.3309352518) = 43.3021582734$$

$$c = 1.4793593051$$

$$y_d = 0.4486726710x_1 - 0.3075904743x_2 + 0.0077715702x_2^2 + 1.4793593051$$

$$(iv) \quad b_{x_2} = .7377581244$$

$$b_{x_1} + b_{x_2} (.4585320785) = .8148502576$$

$$b_{x_1} = .4765644914$$

$$c + b_{x_1} (57.1906474820) + b_{x_2} (67.4748201439) = 43.3021582734$$

$$c = -33.7329703103$$

$$y_d = 0.4765644914x_2 + 0.7377581244 - 33.732970310$$

$$(v) \quad b_{x_1} = .8148502576$$

$$c + b_{x_1} (57.1906474820) = 43.3021582734$$

$$c = -3.299655582$$

$$y_d = 0.8148502576x_1 - 3.299655582$$

III Prediction of PScE Mathematics (y_d) from SSCE English (X_1) and SSCE Mathematics (X_2)

(i) The fitted regression of y_d on $X_1, X_2, X_1^2, X_2^2, X_1X_2$ is

$$y_d = .9662175811X_1 - .3713370280X_2 + .0078346711X_2^2 - .0052771734X_1^2 + .0010746801X_1X_2 - 10.5925691238$$

$$\begin{aligned} \text{Reg. S.S.} &= (.9662175811)(707966) - (.3713370280)(857995) \\ &\quad + (.0078346711)(63533459) - (.0052771734)(42652590) \\ &\quad + (.0010746801)(50974387) - (10.5925691238)(12038) - \frac{(12038)^2}{278} \\ &= 565390.34 - 521271.38 \\ &= 44118.96 \end{aligned}$$

(ii) The fitted regression of y_d on X_1, X_2, X_1^2, X_2^2 is

$$y_d = .9953225796X_1 - .3416181258X_2 + .0080755965X_2^2 - .0048816549X_1^2 - 12.5450178832$$

$$\begin{aligned} \text{Reg. S.S.} &= (.9953225796)(707966) - (.3416181258)(857995) \\ &\quad + (.0080755965)(63533459) - (.0048816549)(42652590) \\ &\quad - (12.5450178832)(12038) - \frac{(12038)^2}{278} \\ &= 565386.33 - 521271.38 \\ &= 44114.95 \end{aligned}$$

(iii) The fitted regression of y_d on X_1, X_2, X_2^2

$$y_d = .4486726710X_1 - .3075904743X_2 + .0077715702X_2^2 + 1.4793593051$$

$$\begin{aligned} \text{Reg. S.S.} &= (.4486726710)(707966) - (.3075904743)(857995) \\ &\quad + (.0077715702)(63533459) + (1.4793593051)(12038) - \frac{(12038)^2}{278} \\ &= 565297.17 - 521271.38 \\ &= 44025.79 \end{aligned}$$

(iv) The fitted regression of y_d on X_1, X_2

$$y_d = .4765644914X_1 + .7377581244X_2 - 33.7329703103$$

$$\begin{aligned} \text{Reg. S.S.} &= (.4765644914)(707966) + (.7377581244)(857995) \\ &\quad - (33.7329703103)(12038) - \frac{(12038)^2}{278} \\ &= 564306.74 - 521271.38 \\ &= 43035.36 \end{aligned}$$

(v) The fitted regression of y_d on X_2

$$y_d = 0.8148502576X_1 - 3.299655582$$

$$\text{Reg. S.S.} = (0.8148502576)(707966) - (3.299655582)(12038) - \frac{(12038)^2}{278}$$