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APPENDICES

APPENDIX A

FORECASTING PROCESS

Table A.1: Deseasonalizing raw material of HP-18 (A)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	3875				3791
Q2-02	231194	4618	3970.75			3913
Q3-02	275690	3779	4071.50	4021.13	0.94	4071
Q4-02	178998	3611	4166.25	4118.88	0.88	4170
Q1-03	215132	4278	4102.00	4134.13	1.03	4186
Q2-03	241078	4997	4261.75	4181.88	1.19	4234
Q3-03	305494	3522				3795
Q4-03	214686	4250				4908
	c1 = 1.03	= 1.03*(4/4.05) =	1.02			
	c2 = 1.19	= 1.19*(4/4.05) =	1.18			
	c3 = 0.94	= 0.94*(4/4.05) =	0.93			
	c4 = 0.88	= 0.88*(4/4.05) =	0.87			
Total	4.05		4.00			

b =	-0.003
a =	4942.960
Ft = (4942.96 -0.003 t)*Cs	

Table A.2: Deseasonalizing [illegible] terial of M-50 (A)

Quarter	Construction Expenditure	[illegible]	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	[illegible]				1023
Q2-02	231194	[illegible]	1085.00			1071
Q3-02	275690	[illegible]	1121.75	1103.38	0.92	1112
Q4-02	178998	[illegible]	1157.25	1139.50	0.86	1148
Q1-03	215132	[illegible]	1152.50	1154.88	1.05	1164
Q2-03	241078	[illegible]	1210.25	1181.38	1.20	1190
Q3-03	305494	[illegible]				1091
Q4-03	214686	[illegible]				1420
	c1 = 1.05	= 1 [illegible]*(4/4.03) =	1.04			
	c2 = 1.20	= 1 [illegible]*(4/4.03) =	1.19			
	c3 = 0.92	= [illegible]*(4/4.03) =	0.92			
	c4 = 0.86	= [illegible]*(4/4.03) =	0.85			
Total	4.03		4.00			

b =	-0.001
a =	1335.624

Ft = (1335.624 -0.001 t)*Cs

Table A.3: Deseasonalizing raw material of IP-820 (A)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	4001				3952
Q2-02	231194	4758	4119.00			4044
Q3-02	275690	3948	4204.25	4161.63	0.95	4214
Q4-02	178998	3769	4282.75	4243.50	0.89	4297
Q1-03	215132	4342	4189.25	4236.00	1.03	4289
Q2-03	241078	5072	4325.50	4257.38	1.19	4311
Q3-03	305494	3574				3814
Q4-03	214686	4314				4918
	c1 = 1.03	= 1.03*(4/4.05) =	1.01			
	c2 = 1.19	= 1.19*(4/4.05) =	1.18			
	c3 = 0.95	= 0.95*(4/4.05) =	0.94			
	c4 = 0.89	= 0.89*(4/4.05) =	0.88			
Total	4.05		4.00			

b =	-0.004
a =	5145.570
Ft = (5145.57 -0.004 t)*Cs	

Table A.4: Deseasonalizing raw material of IP-333 (A)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	59769				57134
Q2-02	231194	71508	60668.50			59944
Q3-02	275690	56893	62785.75	61727.13	0.92	62190
Q4-02	178998	54504	64834.25	63810.00	0.85	64289
Q1-03	215132	68238	64654.50	64744.38	1.05	65230
Q2-03	241078	79702	67975.75	66315.13	1.20	66812
Q3-03	305494	56174				61404
Q4-03	214686	67789				79959

	c1 = 1.05	= 1.05*(4/4.03) =	1.05
	c2 = 1.20	= 1.20*(4/4.03) =	1.19
	c3 = 0.92	= 0.92*(4/4.03) =	0.91
	c4 = 0.85	= 0.85*(4/4.03) =	0.85
Total	4.03		4.00

b =	-0.043
a =	74616.262

Ft = (74616.262 -0.043 t)*Cs

Table A.5: Deseasonalizing raw material of IP-222 (B)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	25870				24945
Q2-02	231194	30909	26345.50			26025
Q3-02	275690	24833	27178.25	26761.88	0.93	27029
Q4-02	178998	23770	27977.75	27578.00	0.86	27854
Q1-03	215132	29201	27779.00	27878.38	1.05	28157
Q2-03	241078	34107	29088.75	28433.88	1.20	28718
Q3-03	305494	24038				26164
Q4-03	214686	29009				33993
	c1 = 1.05	= 1.05*(4/4.04) =	1.04			
	c2 = 1.20	= 1.20*(4/4.04) =	1.19			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.86	= 0.86*(4/4.04) =	0.85			
Total	4.04		4.00			

b =	-0.020
a =	32564.906

Ft = (32564.906 -0.02 t)*Cs

Table A.6: Deseasonalizing raw material of T-47/A (B)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	1717				1667
Q2-02	231194	2048	1755.00			1729
Q3-02	275690	1664	1804.00	1779.50	0.94	1797
Q4-02	178998	1591	1850.50	1827.25	0.87	1846
Q1-03	215132	1913	1828.25	1839.38	1.04	1858
Q2-03	241078	2234	1905.50	1866.88	1.20	1886
Q3-03	305494	1575				1701
Q4-03	214686	1900				2204
	c1 = 1.04	= 1.04*(4/4.04) =	1.03			
	c2 = 1.20	= 1.20*(4/4.04) =	1.18			
	c3 = 0.94	= 0.94*(4/4.04) =	0.93			
	c4 = 0.87	= 0.87*(4/4.04) =	0.86			
Total	4.04		4.00			

b =	-0.001
a =	2174.981
Ft = (2174.981 -0.001 t)*Cs	

Table A.7: Deseasonalizing raw material of M-56 (B)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	270				262
Q2-02	231194	331	277.50			273
Q3-02	275690	261	286.00	281.75	0.93	285
Q4-02	178998	248	294.00	290.00	0.86	294
Q1-03	215132	304	289.25	291.63	1.04	295
Q2-03	241078	363	302.75	296.00	1.23	300
Q3-03	305494	242				265
Q4-03	214686	302				358
	c1 = 1.04	= 1.04*(4/4.05) =	1.03			
	c2 = 1.23	= 1.23*(4/4.05) =	1.21			
	c3 = 0.93	= 0.93*(4/4.05) =	0.91			
	c4 = 0.86	= 0.86*(4/4.05) =	0.84			
Total	4.05		4.00			

b =	0.000
a =	356.906
Ft = (356.906 -0.000 t)*Cs	

Table A.8: Deseasonalizing raw material of IP-555 (B)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	23211				22120
Q2-02	231194	27788	23521.00			23271
Q3-02	275690	22000	24381.00	23951.00	0.92	24131
Q4-02	178998	21085	25216.25	24798.63	0.85	24985
Q1-03	215132	26651	25201.25	25208.75	1.06	25398
Q2-03	241078	31129	26549.00	25875.13	1.20	26069
Q3-03	305494	21940				24065
Q4-03	214686	26476				31373
	c1 = 1.06	= 1.06*(4/4.03) =	1.05			
	c2 = 1.20	= 1.20*(4/4.03) =	1.19			
	c3 = 0.92	= 0.92*(4/4.03) =	0.91			
	c4 = 0.85	= 0.85*(4/4.03) =	0.84			
Total	4.03		4.00			

b =	-0.016
a =	28891.462

Ft = (28891.462 -0.016 t)*Cs

Table A.9: Deseasonalizing raw material of M-10 (B)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	200				193
Q2-02	231194	239	203.75			202
Q3-02	275690	192	210.25	207.00	0.93	209
Q4-02	178998	184	216.25	213.25	0.86	215
Q1-03	215132	226	214.75	215.50	1.05	218
Q2-03	241078	263	224.75	219.75	1.20	222
Q3-03	305494	186				203
Q4-03	214686	224				262
	c1 = 1.05	= 1.05*(4/4.04) =	1.04			
	c2 = 1.20	= 1.20*(4/4.04) =	1.18			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.86	= 0.86*(4/4.04) =	0.85			
Total	4.04		4.00			

b =	0.000
a =	251.010
Ft = (251.01 -0.000 t)*Cs	

Table A.10: Deseasonalizing raw material of IP-28 (B)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	7113				6778
Q2-02	231194	8516	7207.75			7132
Q3-02	275690	6741	7471.75	7339.75	0.92	7395
Q4-02	178998	6461	7728.00	7599.88	0.85	7657
Q1-03	215132	8169	7724.00	7726.00	1.06	7784
Q2-03	241078	9541	8137.50	7930.75	1.20	7990
Q3-03	305494	6725				7377
Q4-03	214686	8115				9617
	c1 = 1.06	= 1.06*(4/4.03) =	1.05			
	c2 = 1.20	= 1.20*(4/4.03) =	1.19			
	c3 = 0.92	= 0.92*(4/4.03) =	0.91			
	c4 = 0.85	= 0.85*(4/4.03) =	0.84			
Total	4.03		4.00			

b =	-0.005
a =	8852.353

Ft = (8852.353 -0.005 t)*Cs

Table A.11: Deseasonalizing raw material of M-32 (B)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	346				335
Q2-02	231194	414	353.00			349
Q3-02	275690	333	363.75	358.38	0.93	362
Q4-02	178998	319	374.00	368.88	0.86	373
Q1-03	215132	389	371.00	372.50	1.04	376
Q2-03	241078	455	388.00	379.50	1.20	383
Q3-03	305494	321				349
Q4-03	214686	387				452
	c1 = 1.04	= 1.04*(4/4.04) =	1.03			
	c2 = 1.20	= 1.20*(4/4.04) =	1.19			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.86	= 0.86*(4/4.04) =	0.86			
Total	4.04		4.00			

b =	0.000
a =	435.629
Ft = (435.629 -0.000 t)*Cs	

Table A.12: Deseasonalizing raw material of WDOR-100 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	45				41
Q2-02	231194	70	47.50			48
Q3-02	275690	40	51.75	49.63	0.81	50
Q4-02	178998	35	55.75	53.75	0.65	54
Q1-03	215132	62	55.00	55.38	1.12	56
Q2-03	241078	86	61.50	58.25	1.48	59
Q3-03	305494	37				46
Q4-03	214686	61				95
	c1 = 1.12	= 1.12*(4/4.05) =	1.11			
	c2 = 1.48	= 1.48*(4/4.05) =	1.46			
	c3 = 0.81	= 0.81*(4/4.05) =	0.80			
	c4 = 0.65	= 0.65*(4/4.05) =	0.64			
Total	4.05		4.00			

b =	0.000
a =	83.806

Ft = (83.806 -0.000 t)*Cs

Table A.13: Deseasonalizing raw material of T-27 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	493				481
Q2-02	231194	588	505.00			498
Q3-02	275690	480	518.50	511.75	0.94	518
Q4-02	178998	459	531.25	524.88	0.87	531
Q1-03	215132	547	523.75	527.50	1.04	534
Q2-03	241078	639	544.75	534.25	1.20	541
Q3-03	305494	450				486
Q4-03	214686	543				629
	c1 = 1.04	= 1.04*(4/4.05) =	1.02			
	c2 = 1.20	= 1.20*(4/4.05) =	1.18			
	c3 = 0.94	= 0.94*(4/4.05) =	0.93			
	c4 = 0.87	= 0.87*(4/4.05) =	0.86			
Total	4.05		4.00			

b =	-0.0004
a =	628.385
Ft = (628.385 -0.0004 t)*Cs	

Table A.14: Deseasonalizing raw material of M-85 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	111				107
Q2-02	231194	133	113.25			112
Q3-02	275690	107	116.75	115.00	0.93	116
Q4-02	178998	102	120.00	118.38	0.86	120
Q1-03	215132	125	119.00	119.50	1.05	121
Q2-03	241078	146	124.50	121.75	1.20	123
Q3-03	305494	103				112
Q4-03	214686	124				145
	c1 = 1.05	= 1.05*(4/4.04) =	1.04			
	c2 = 1.20	= 1.20*(4/4.04) =	1.19			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.86	= 0.86*(4/4.04) =	0.85			
Total	4.04		4.00			

b =	-0.0001
a =	140.087

Ft = (140.087 -0.0001 t)*Cs

Table A.15: Deseasonalizing raw material of M-75 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	227				219
Q2-02	231194	271	231.25			228
Q3-02	275690	218	238.25	234.75	0.93	237
Q4-02	178998	209	245.00	241.63	0.86	244
Q1-03	215132	255	243.00	244.00	1.05	246
Q2-03	241078	298	254.00	248.50	1.20	251
Q3-03	305494	210				228
Q4-03	214686	253				295
	c1 = 1.05	= 1.05*(4/4.04) =	1.03			
	c2 = 1.20	= 1.20*(4/4.04) =	1.19			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.86	= 0.86*(4/4.04) =	0.86			
Total	4.04		4.00			

b =	-0.0002
a =	285.255

Ft = (285.255 -0.0002 t)*Cs

Table A.16: Deseasonalizing raw material of M-92 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	141				138
Q2-02	231194	168	144.75			142
Q3-02	275690	138	148.50	146.63	0.94	148
Q4-02	178998	132	152.00	150.25	0.88	152
Q1-03	215132	156	149.50	150.75	1.03	153
Q2-03	241078	182	155.25	152.38	1.19	154
Q3-03	305494	128				138
Q4-03	214686	155				179
	c1 = 1.03	= 1.03*(4/4.05) =	1.02			
	c2 = 1.19	= 1.19*(4/4.05) =	1.18			
	c3 = 0.94	= 0.94*(4/4.05) =	0.93			
	c4 = 0.88	= 0.88*(4/4.05) =	0.87			
Total	4.05		4.00			

b =	-0.0001
a =	180.848

Ft = (180.848 -0.0001 t)*Cs

Table A.17: Deseasonalizing raw material of WDYE-32 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	32				29
Q2-02	231194	48	33.00			33
Q3-02	275690	28	35.75	34.38	0.81	35
Q4-02	178998	24	38.50	37.13	0.65	38
Q1-03	215132	43	38.00	38.25	1.12	39
Q2-03	241078	59	42.50	40.25	1.47	41
Q3-03	305494	26				32
Q4-03	214686	42				66
	c1 = 1.12	= 1.12*(4/4.05) =	1.11			
	c2 = 1.47	= 1.47*(4/4.05) =	1.45			
	c3 = 0.81	= 0.81*(4/4.05) =	0.80			
	c4 = 0.65	= 0.65*(4/4.05) =	0.64			
Total	4.05		4.00			

b =	-0.0001
a =	58.021
Ft = (58.021 -0.0001 t)*Cs	

Table A.18: Deseasonalizing raw material of LP-100 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	214				207
Q2-02	231194	255	218.50			215
Q3-02	275690	207	224.75	221.63	0.93	224
Q4-02	178998	198	230.75	227.75	0.87	230
Q1-03	215132	239	228.00	229.38	1.04	232
Q2-03	241078	279	237.75	232.88	1.20	235
Q3-03	305494	196				212
Q4-03	214686	237				275
	c1 = 1.04	= 1.04*(4/4.04) =	1.03			
	c2 = 1.20	= 1.20*(4/4.04) =	1.19			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.87	= 0.87*(4/4.04) =	0.86			
Total	4.04		4.00			

b =	-0.0002
a =	271.464

Ft = (271.464 -0.0002 t)*Cs

Table A.19: Deseasonalizing raw material of M-46 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	235				232
Q2-02	231194	280	242.25			238
Q3-02	275690	232	247.25	244.75	0.95	248
Q4-02	178998	222	251.75	249.50	0.89	253
Q1-03	215132	255	246.25	249.00	1.02	252
Q2-03	241078	298	254.25	250.25	1.19	253
Q3-03	305494	210				224
Q4-03	214686	254				289
	c1 = 1.02	= 1.02*(4/4.05) =	1.01			
	c2 = 1.19	= 1.19*(4/4.05) =	1.18			
	c3 = 0.95	= 0.95*(4/4.05) =	0.94			
	c4 = 0.89	= 0.89*(4/4.05) =	0.88			
Total	4.05		4.00			

b =	-0.0002
a =	302.395

Ft = (302.395 -0.0002 t)*Cs

Table A.20: Deseasonalizing raw material of M-95 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	38				37
Q2-02	231194	46	39.50			39
Q3-02	275690	38	40.50	40.00	0.95	41
Q4-02	178998	36	41.25	40.88	0.88	41
Q1-03	215132	42	40.25	40.75	1.03	41
Q2-03	241078	49	41.50	40.88	1.20	41
Q3-03	305494	34				36
Q4-03	214686	41				47
	c1 = 1.03	= 1.03*(4/4.06) =	1.02			
	c2 = 1.20	= 1.20*(4/4.06) =	1.18			
	c3 = 0.95	= 0.95*(4/4.06) =	0.94			
	c4 = 0.88	= 0.88*(4/4.06) =	0.87			
Total	4.06		4.00			

b =	0.0000
a =	49.900
Ft = (49.9 -0.000 t)*Cs	

Table A.21: Deseasonalizing raw material of M-87 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	148				143
Q2-02	231194	176	151.00			149
Q3-02	275690	143	155.25	153.13	0.93	155
Q4-02	178998	137	159.25	157.25	0.87	159
Q1-03	215132	165	157.50	158.38	1.04	160
Q2-03	241078	192	164.25	160.88	1.19	162
Q3-03	305494	136				147
Q4-03	214686	164				190
	c1 = 1.04	= 1.04*(4/4.04) =	1.03			
	c2 = 1.19	= 1.19*(4/4.04) =	1.18			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.87	= 0.87*(4/4.04) =	0.86			
Total	4.04		4.00			

b =	-0.0001
a =	186.560
Ft = (186.56 -0.0001 t)*Cs	

Table A.22: Deseasonalizing raw material of WDYE-75 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	8				7
Q2-02	231194	13	8.50			9
Q3-02	275690	7	9.25	8.88	0.79	9
Q4-02	178998	6	10.00	9.63	0.62	10
Q1-03	215132	11	9.75	9.88	1.11	10
Q2-03	241078	16	11.00	10.38	1.54	11
Q3-03	305494	6				8
Q4-03	214686	11				18
	c1 = 1.11	= 1.11*(4/4.07) =	1.09			
	c2 = 1.54	= 1.54*(4/4.07) =	1.52			
	c3 = 0.79	= 0.79*(4/4.07) =	0.78			
	c4 = 0.62	= 0.62*(4/4.07) =	0.61			
Total	4.07		4.00			

b =	0.0000
a =	16.409

Ft = (16.409 -0.000 t)*Cs

Table A.23: Deseasonalizing raw material of WDCE-15 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	6				5
Q2-02	231194	9	5.75			6
Q3-02	275690	4	6.25	6.00	0.67	6
Q4-02	178998	4	6.75	6.50	0.62	6
Q1-03	215132	8	7.00	6.88	1.16	7
Q2-03	241078	11	7.75	7.38	1.49	7
Q3-03	305494	5				7
Q4-03	214686	7				11
	c1 = 1.16	= 1.16*(4/3.94) =	1.18			
	c2 = 1.49	= 1.49*(4/3.94) =	1.51			
	c3 = 0.67	= 0.67*(4/3.94) =	0.68			
	c4 = 0.62	= 0.62*(4/3.94) =	0.62			
Total	3.94		4.00			

b =	0.0000
a =	7.520

Ft = (7.52 -0.000 t)*Cs

Table A.24: Deseasonalizing raw material of M-48 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	282				272
Q2-02	231194	337	287.25			284
Q3-02	275690	271	296.25	291.75	0.93	295
Q4-02	178998	259	305.00	300.63	0.86	304
Q1-03	215132	318	302.75	303.88	1.05	307
Q2-03	241078	372	317.00	309.88	1.20	313
Q3-03	305494	262				285
Q4-03	214686	316				370
	c1 = 1.05	= 1.05*(4/4.04) =	1.04			
	c2 = 1.20	= 1.20*(4/4.04) =	1.19			
	c3 = 0.93	= 0.93*(4/4.04) =	0.92			
	c4 = 0.86	= 0.86*(4/4.04) =	0.85			
Total	4.04		4.00			

b =	-0.0002
a =	355.451

Ft = (355.451 -0.0002 t)*Cs

Table A.25: Deseasonalizing raw material of WDYE-180 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	12				11
Q2-02	231194	21	12.75			13
Q3-02	275690	10	14.25	13.50	0.74	14
Q4-02	178998	8	15.75	15.00	0.53	15
Q1-03	215132	18	15.50	15.63	1.15	16
Q2-03	241078	27	17.75	16.63	1.62	17
Q3-03	305494	9				12
Q4-03	214686	17				32
	c1 = 1.15	= 1.15*(4/4.05) =	1.14			
	c2 = 1.62	= 1.62*(4/4.05) =	1.60			
	c3 = 0.74	= 0.74*(4/4.05) =	0.73			
	c4 = 0.53	= 0.53*(4/4.05) =	0.53			
Total	4.05		4.00			

b =	0.0000
a =	27.448

Ft = (27.448 -0.000 t)*Cs

Table A.26: Deseasonalizing raw material of WDBE-690 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	4				4
Q2-02	231194	5	3.75			3
Q3-02	275690	3	4.00	3.88	0.77	4
Q4-02	178998	3	4.50	4.25	0.71	4
Q1-03	215132	5	4.50	4.50	1.11	5
Q2-03	241078	7	5.00	4.75	1.47	5
Q3-03	305494	3				4
Q4-03	214686	5				7
	c1 = 1.11	= 1.11*(4/4.06) =	1.09			
	c2 = 1.47	= 1.47*(4/4.06) =	1.45			
	c3 = 0.77	= 0.77*(4/4.06) =	0.76			
	c4 = 0.71	= 0.71*(4/4.06) =	0.70			
Total	4.06		4.00			

b =	0.0000
a =	6.360
Ft = (6.36 -0.000 t)*Cs	

Table A.27: Deseasonalizing raw material of WDBK-50 (C)

Quarter	Construction Expenditure	Actual	Moving Average	Centered M.A.	Seasonal Ratio	Deseasonalized Data
Q1-02	217092	10				9
Q2-02	231194	15	10.00			10
Q3-02	275690	8	10.75	10.38	0.77	10
Q4-02	178998	7	11.50	11.13	0.63	11
Q1-03	215132	13	11.50	11.50	1.13	12
Q2-03	241078	18	13.00	12.25	1.47	12
Q3-03	305494	8				10
Q4-03	214686	13				21
	c1 = 1.13	= 1.13*(4/4.00) =	1.13			
	c2 = 1.47	= 1.47*(4/4.00) =	1.47			
	c3 = 0.77	= 0.77*(4/4.00) =	0.77			
	c4 = 0.63	= 0.63*(4/4.00) =	0.63			
Total	4.00		4.00			

b =	0.0000
a =	16.919
Ft = (16.919 -0.000 t)*Cs	

APPENDIX B

ORDERING QUANTITY DATA

Table B.1: Raw Material Size and Quantity Order

Item	Raw Material	Raw Material Size	Order Quantity
1A	RS-022	1 pail / 100 Kg	6000 Kg
2A	HP-18	1 bag / 25 Kg	6000 Kg
3A	M-50	1 bag / 25 Kg	1000 Kg
4A	IP-820	1 bag / 25 Kg	3000 Kg
5A	IP-333	1 bag / 25 Kg and 1 pail / 500 Kg	30000 Kg
6B	IP-222	1 bag / 25 Kg and 1 pail / 500 Kg	20000 Kg
7B	T-47/A	1 pail / 225 Kg	10 pails
8B	M-56	1 bag / 25 Kg	500 Kg
9B	IP-555	1 bag / 25 Kg and 1 pail / 500 Kg	15000 Kg
10B	M-10	1 bag / 25 Kg	500 kg
11B	IP-28	1 bag / 25 Kg	6000 Kg
12B	M-32	1 bag / 25 Kg	700 kg
13C	WDOR-100	1 pail / 25 Kg	200 Kg
14C	T-27	1 pail / 190 Kg	5 pails
15C	M-85	1 pail / 25 Kg	400 Kg
16C	M-92	1 pail / 30 Kg	200 Kg
17C	M-75	1 pail / 180 Kg	3 pails
18C	WDYE-32	1 pail / 25 Kg	200 Kg
19C	LP-100	1 pail / 200 Kg	3 pails
20C	M-46	1 bag / 25 Kg	500 Kg
21C	M-95	1 pail / 190.56 Kg	200 Kg
22C	M-87	1 bag / 25 Kg	500 Kg
23C	WDYE-75	1 pail / 25 Kg	100 Kg
24C	WDCE-15	1 pail / 25 Kg	100 Kg
25C	M-48	1 pail / 22 Kg	440 Kg
26C	WDYE-180	1 pail / 25 Kg	100 Kg
27C	WDBE-690	1 pail / 25 Kg	100 Kg
28C	WDBK-50	1 pail / 25 Kg	100 Kg

APPENDIX C

Z - DISTRIBUTION

Table C.1: Cumulative Standard Normal Distribution

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.00	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.10	0.53983	0.54380	0.54776	0.51172	0.55567	0.55692	0.56356	0.56749	0.57142	0.57535
0.20	0.57926	0.58319	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61406
0.30	0.61791	0.62172	0.62552	0.06093	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.40	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.50	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71226	0.71566	0.71904	0.72240
0.60	0.72575	0.72907	0.73237	0.73536	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.70	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.80	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.90	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.00	0.84134	0.84378	0.84614	0.84849	0.85083	0.85315	0.85543	0.85769	0.85993	0.86214
1.10	0.86433	0.86650	0.86864	0.87076	0.87286	0.87493	0.87698	0.87900	0.88100	0.88298
1.20	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.30	0.90320	0.90490	0.90658	0.90824	0.90988	0.91149	0.91309	0.91466	0.91621	0.91774
1.40	0.91924	0.92073	0.92220	0.92364	0.92507	0.92647	0.92785	0.92922	0.93560	0.93189
1.50	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.60	0.94520	0.94630	0.94738	0.94845	0.94950	0.95053	0.95154	0.95254	0.95352	0.95449
1.70	0.95543	0.95637	0.95728	0.95818	0.95907	0.95994	0.96080	0.96164	0.96246	0.96327
1.80	0.96407	0.96485	0.96562	0.96638	0.96712	0.96784	0.96856	0.96826	0.96995	0.97062
1.90	0.97128	0.97193	0.97257	0.97320	0.97381	0.97441	0.97500	0.97558	0.97615	0.97670
2.00	0.97725	0.97784	0.97831	0.97882	0.97932	0.97982	0.98030	0.98077	0.98124	0.98169
2.10	0.98214	0.98257	0.98300	0.98341	0.98382	0.98422	0.98461	0.98500	0.98537	0.98574
2.20	0.98610	0.98645	0.98679	0.98713	0.98745	0.98778	0.98809	0.98840	0.98870	0.98899
2.30	0.98928	0.98956	0.98983	0.99010	0.99036	0.99061	0.99086	0.99111	0.99134	0.99158
2.40	0.99180	0.99202	0.99224	0.99245	0.99266	0.99286	0.99305	0.99324	0.99343	0.99361
2.50	0.99379	0.99396	0.99413	0.99430	0.99446	0.99461	0.99477	0.99492	0.99506	0.99520
2.60	0.99534	0.99547	0.99560	0.99573	0.99858	0.99598	0.09961	0.99621	0.99632	0.99643
2.70	0.99653	0.99664	0.99674	0.99683	0.99693	0.99702	0.99711	0.99720	0.99728	0.99736
2.80	0.99744	0.99752	0.99760	0.99767	0.99774	0.99781	0.99788	0.99795	0.99801	0.99807
2.90	0.99813	0.99819	0.99825	0.99831	0.99836	0.99841	0.99846	0.99851	0.99856	0.99861
3.00	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99899	0.99893	0.99896	0.99900
3.10	0.99903	0.99906	0.99910	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929
3.20	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
3.30	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
3.40	0.99966	0.99968	0.99969	0.99970	0.99971	0.09997	0.99973	0.99974	0.99975	0.99976
3.50	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983
3.60	0.99984	0.99985	0.99985	0.99986	0.99986	0.99987	0.99987	0.99988	0.99988	0.99989
3.70	0.99989	0.99990	0.99990	0.99990	0.99991	0.99991	0.99992	0.99992	0.99992	0.99992
3.80	0.99993	0.99993	0.99993	0.99994	0.99994	0.99994	0.99994	0.99995	0.99995	0.99995

BIOGRAPHY

Mr. Kriengkrai Varavichit was born on October 18th, 1980 in Bangkok, Thailand. He graduated from Sirindhorn International Institute of Technology, Thammasat University in 2001 with a Bechelor degree in Industrial Engineering. In 2002, he studied for the Master degree in Engineering Management at The Regional Centre for Manufacturing Systems Engineering, Faculty of Engineering, Chulalongkorn University and University of Warwick.