



Experiment No. 7

January 27, 2016, 4:52 pm

Calibration Of Singly Constrained Gravity Model (Origin)

Input Values :

Base Year Origin-Destination Cost Matrix		
Origin	Destination	Cost
1	1	0
1	2	10
1	3	25
1	4	14
1	5	8
1	6	19
1	7	25
1	8	23
1	9	27
1	10	24



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1	11	36
1	12	66
1	13	31
1	14	42

Origin	Destination	Cost
2	1	10
2	2	0
2	3	22
2	4	17
2	5	15
2	6	23
2	7	27
2	8	14
2	9	23



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2	10	22
2	11	40
2	12	63
2	13	26
2	14	38

Origin	Destination	Cost
3	1	24
3	2	22
3	3	0
3	4	13
3	5	25
3	6	38
3	7	38
3	8	28



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3	9	17
3	10	11
3	11	49
3	12	57
3	13	27
3	14	37

Origin	Destination	Cost
4	1	14
4	2	17
4	3	13
4	4	0
4	5	18
4	6	26
4	7	28



4	8	26
4	9	30
4	10	25
4	11	40
4	12	67
4	13	32
4	14	45

Origin	Destination	Cost
5	1	8
5	2	15
5	3	26
5	4	20
5	5	0
5	6	20



5	7	21
5	8	28
5	9	32
5	10	29
5	11	29
5	12	65
5	13	36
5	14	47

Origin	Destination	Cost
6	1	22
6	2	23
6	3	32
6	4	22
6	5	21



6	6	0
6	7	23
6	8	32
6	9	35
6	10	32
6	11	44
6	12	77
6	13	42
6	14	52

Origin	Destination	Cost
7	1	28
7	2	30
7	3	36
7	4	32



7	5	21
7	6	27
7	7	0
7	8	39
7	9	43
7	10	40
7	11	29
7	12	65
7	13	47
7	14	58

Origin	Destination	Cost
8	1	24
8	2	14
8	3	28



8	4	28
8	5	26
8	6	35
8	7	40
8	8	0
8	9	27
8	10	22
8	11	46
8	12	50
8	13	33
8	14	45

Origin	Destination	Cost
9	1	29
9	2	30



9	3	17
9	4	23
9	5	30
9	6	43
9	7	43
9	8	35
9	9	0
9	10	15
9	11	63
9	12	57
9	13	23
9	14	32

Origin	Destination	Cost
10	1	23



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10	2	19
10	3	11
10	4	25
10	5	25
10	6	34
10	7	39
10	8	22
10	9	15
10	10	0
10	11	53
10	12	60
10	13	25
10	14	35

Origin	Destination	Cost
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11	1	46
11	2	48
11	3	55
11	4	48
11	5	32
11	6	43
11	7	32
11	8	57
11	9	64
11	10	60
11	11	0
11	12	52
11	13	68
11	14	76



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Origin	Destination	Cost
12	1	58
12	2	54
12	3	61
12	4	62
12	5	60
12	6	69
12	7	57
12	8	41
12	9	61
12	10	55
12	11	37
12	12	0
12	13	58
12	14	62



Origin	Destination	Cost
13	1	34
13	2	29
13	3	38
13	4	36
13	5	37
13	6	45
13	7	51
13	8	36
13	9	27
13	10	32
13	11	62
13	12	52
13	13	0
13	14	18



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Origin	Destination	Cost
14	1	44
14	2	39
14	3	30
14	4	35
14	5	42
14	6	54
14	7	55
14	8	45
14	9	33
14	10	33
14	11	75
14	12	61
14	13	18
14	14	0



Given Base Year Trip Matrix		
Origin	Destination	No. of Trips
1	1	210.7042
1	2	618.8386
1	3	349.4873
1	4	377.6769
1	5	301.7685
1	6	286.1444
1	7	388.6878
1	8	586.3344
1	9	303.784
1	10	582.8284
1	11	89.5414
1	12	131.6293
1	13	437.4705



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1	14	605.5515
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Origin	Destination	No. of Trips
2	1	357.4129
2	2	1282.1337
2	3	675.1288
2	4	687.097
2	5	527.4724
2	6	515.3947
2	7	714.2357
2	8	1202.7028
2	9	592.7385
2	10	1114.6871
2	11	161.2792
2	12	254.2775



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2	13	862.1641
2	14	1181.5424

Origin	Destination	No. of Trips
3	1	176.9598
3	2	585.9954
3	3	479.1121
3	4	407.2823
3	5	271.8166
3	6	252.6396
3	7	364.397
3	8	595.4739
3	9	358.4483
3	10	708.6488
3	11	83.9455



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3	12	153.7699
3	13	486.1303
3	14	679.6697

Origin	Destination	No. of Trips
4	1	211.9715
4	2	667.7014
4	3	455.9867
4	4	502.7211
4	5	315.973
4	6	308.738
4	7	436.4933
4	8	658.4488
4	9	341.147
4	10	667.7335



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4	11	99.5537
4	12	150.8048
4	13	501.2003
4	14	680.0294

Origin	Destination	No. of Trips
5	1	435.0577
5	2	1316.679
5	3	773.9371
5	4	795.5729
5	5	731.1974
5	6	633.6648
5	7	904.8778
5	8	1247.5209
5	9	646.3495



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5	10	1240.0612
5	11	214.8036
5	12	297.3807
5	13	930.789
5	14	1288.4083

Origin	Destination	No. of Trips
6	1	81.5734
6	2	262.1434
6	3	157.1993
6	4	168.1887
6	5	127.8308
6	6	166.9249
6	7	191.2964
6	8	258.5108



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6	9	135.2824
6	10	259.5476
6	11	39.8749
6	12	56.8853
6	13	189.0585
6	14	264.327

Origin	Destination	No. of Trips
7	1	324.1743
7	2	1031.3979
7	3	637.3335
7	4	642.1777
7	5	539.4155
7	6	537.7117
7	7	1015.9734



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7	8	1017.1055
7	9	526.9697
7	10	1011.0237
7	11	195.4934
7	12	270.6471
7	13	758.8736
7	14	1050.4412

Origin	Destination	No. of Trips
8	1	642.546
8	2	2304.9802
8	3	1314.8135
8	4	1272.8604
8	5	977.1528
8	6	945.2784



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8	7	1296.9354
8	8	2860.8474
8	9	1177.6779
8	10	2305.0913
8	11	314.0913
8	12	598.827
8	13	1662.3577
8	14	2278.1577

Origin	Destination	No. of Trips
9	1	166.4501
9	2	534.9026
9	3	399.6972
9	4	364.4099
9	5	255.6732



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9	6	237.6352
9	7	342.7553
9	8	549.0175
9	9	420.127
9	10	673.2609
9	11	72.164
9	12	152.0531
9	13	500.3208
9	14	706.5399

Origin	Destination	No. of Trips
10	1	316.3469
10	2	1068.7324
10	3	759.645
10	4	639.3315



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10	5	481.0851
10	6	465.3923
10	7	638.5248
10	8	1119.0935
10	9	647.2296
10	10	1400.069
10	11	142.7486
10	12	264.1122
10	13	877.7776
10	14	1227.2406

Origin	Destination	No. of Trips
11	1	176.6679
11	2	562.0894
11	3	343.8768



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11	4	357.0427
11	5	315.2848
11	6	298.961
11	7	481.3492
11	8	554.3003
11	9	278.6993
11	10	540.0756
11	11	170.4628
11	12	201.1008
11	13	401.3467
11	14	572.4674

Origin	Destination	No. of Trips
12	1	429.7794
12	2	1451.9478



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12	3	888.2773
12	4	851.3776
12	5	653.5878
12	6	632.2681
12	7	1028.2291
12	8	1784.1672
12	9	787.713
12	10	1557.301
12	11	322.9565
12	12	927.7911
12	13	1216.613
12	14	1806.1563

Origin	Destination	No. of Trips
13	1	402.8568



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13	2	1374.6715
13	3	824.348
13	4	814.1663
13	5	606.5491
13	6	592.6608
13	7	805.0482
13	8	1383.0076
13	9	816.0231
13	10	1445.2222
13	11	185.4576
13	12	406.7161
13	13	1602.2031
13	14	2067.8508

Origin	Destination	No. of Trips
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14	1	232.5497
14	2	793.5313
14	3	569.7032
14	4	524.627
14	5	368.083
14	6	345.5527
14	7	493.4517
14	8	806.3668
14	9	490.2745
14	10	912.8222
14	11	103.8917
14	12	237.1371
14	13	853.7665
14	14	1579.3805



Sum Totals of Origin		Sum Totals of Destination	
Origin	Totals	Destination	Totals
O1	5270.4472	D1	4165.0506
O2	10128.2668	D2	13855.7446
O3	5604.2892	D3	8628.5458
O4	5998.5025	D4	8404.532
O5	11456.2999	D5	6472.89
O6	2358.6434	D6	6218.9666
O7	9558.7382	D7	9102.2551
O8	19951.617	D8	14622.8974
O9	5375.0067	D9	7522.4638
O10	10047.3291	D10	14418.3725
O11	5253.7247	D11	2196.2642
O12	14338.1652	D12	4103.132
O13	13326.7812	D13	11280.0717



O14	8311.1379	D14	15987.7627
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Selected Frictional Functions : Exponential Function [$F_{ij} = e^{-BC_{ij}}$]

Solution :

Trip Matrix with respect to Optimal Beta Value (Minimum SSE)		
Origin	Destination	No. of Trips
1	1	177
1	2	583
1	3	357
1	4	352
1	5	273
1	6	259
1	7	377



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1	8	607
1	9	311
1	10	598
1	11	90
1	12	163
1	13	465
1	14	652

Origin	Destination	No. of Trips
2	1	336
2	2	1129
2	3	688
2	4	673
2	5	519
2	6	495



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2	7	722
2	8	1175
2	9	599
2	10	1150
2	11	172
2	12	314
2	13	896
2	14	1254

Origin	Destination	No. of Trips
3	1	184
3	2	613
3	3	390
3	4	375
3	5	285



3	6	270
3	7	396
3	8	643
3	9	334
3	10	645
3	11	94
3	12	175
3	13	496
3	14	697

Origin	Destination	No. of Trips
4	1	199
4	2	660
4	3	413
4	4	407



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4	5	308
4	6	293
4	7	429
4	8	690
4	9	354
4	10	681
4	11	102
4	12	186
4	13	529
4	14	741

Origin	Destination	No. of Trips
5	1	383
5	2	1265
5	3	779



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5	4	763
5	5	600
5	6	565
5	7	826
5	8	1318
5	9	675
5	10	1298
5	11	197
5	12	356
5	13	1009
5	14	1414

Origin	Destination	No. of Trips
6	1	78
6	2	259



6	3	160
6	4	157
6	5	121
6	6	119
6	7	170
6	8	271
6	9	139
6	10	267
6	11	40
6	12	72
6	13	207
6	14	291

Origin	Destination	No. of Trips
7	1	316



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7	2	1050
7	3	649
7	4	635
7	5	494
7	6	472
7	7	710
7	8	1098
7	9	562
7	10	1081
7	11	166
7	12	300
7	13	840
7	14	1178

Origin	Destination	No. of Trips
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8	1	656
8	2	2205
8	3	1354
8	4	1319
8	5	1018
8	6	969
8	7	1411
8	8	2360
8	9	1181
8	10	2276
8	11	338
8	12	630
8	13	1761
8	14	2467



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Origin	Destination	No. of Trips
9	1	176
9	2	585
9	3	369
9	4	357
9	5	273
9	6	259
9	7	379
9	8	614
9	9	327
9	10	618
9	11	89
9	12	168
9	13	480
9	14	674



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Origin	Destination	No. of Trips
10	1	329
10	2	1101
10	3	691
10	4	664
10	5	511
10	6	487
10	7	709
10	8	1159
10	9	600
10	10	1168
10	11	168
10	12	313
10	13	891
10	14	1250



Origin	Destination	No. of Trips
11	1	173
11	2	576
11	3	356
11	4	349
11	5	273
11	6	260
11	7	384
11	8	603
11	9	308
11	10	593
11	11	95
11	12	170
11	13	460
11	14	647



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Origin	Destination	No. of Trips
12	1	468
12	2	1565
12	3	968
12	4	942
12	5	727
12	6	692
12	7	1025
12	8	1673
12	9	844
12	10	1627
12	11	252
12	12	489
12	13	1269
12	14	1792



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Origin	Destination	No. of Trips
13	1	435
13	2	1457
13	3	899
13	4	877
13	5	675
13	6	643
13	7	936
13	8	1527
13	9	792
13	10	1512
13	11	223
13	12	421
13	13	1221
13	14	1700



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Origin	Destination	No. of Trips
14	1	270
14	2	902
14	3	567
14	4	549
14	5	420
14	6	399
14	7	583
14	8	947
14	9	493
14	10	945
14	11	138
14	12	261
14	13	750
14	14	1083



Minimum Residual = 341099.14338838

Optimal Beta = 0.001

Target Oi	Modelled Oi	Target Dj	Modelled Dj
5270.4472	5270.4472	4165.0506	4185.0582204155
10128.2668	10128.2668	13855.7446	13958.291147719
5604.2892	5604.2892	8628.5458	8646.677522012
5998.5025	5998.5025	8404.532	8427.4188743412
11456.2999	11456.2999	6472.89	6503.8449820082
2358.6434	2358.6434	6218.9666	6188.4779994328
9558.7382	9558.7382	9102.2551	9065.3316435284
19951.617	19951.617	14622.8974	14692.821472414
5375.0067	5375.0067	7522.4638	7525.5045691021
10047.3291	10047.3291	14418.3725	14466.266209042
5253.7247	5253.7247	2196.2642	2171.0042596878
14338.1652	14338.1652	4103.132	4023.4445006347



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13326.7812	13326.7812	11280.0717	11280.090535402
8311.1379	8311.1379	15987.7627	15844.71706426

Beta	Residual SSE
0.001	341099.14338838
0.002	341099.14338838
0.003	341099.14338838
0.004	341099.14338838
0.005	341099.14338838
0.006	341099.14338838
0.007	341099.14338838
0.008	341099.14338838
0.009	341099.14338838
0.01	341099.14338838



0.011	341099.14338838
0.012	341099.14338838
0.013	341099.14338838
0.014	341099.14338838
0.015	341099.14338838
0.016	341099.14338838
0.017	341099.14338838
0.018	341099.14338838
0.019	341099.14338838
0.02	341099.14338838
0.021	341099.14338838
0.022	341099.14338838
0.023	341099.14338838
0.024	341099.14338838
0.025	341099.14338838



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0.026	341099.14338838
0.027	341099.14338838
0.028	341099.14338838
0.029	341099.14338838
0.03	341099.14338838
0.031	341099.14338838
0.032	341099.14338838
0.033	341099.14338838
0.034	341099.14338838
0.035	341099.14338838
0.036	341099.14338838
0.037	341099.14338838
0.038	341099.14338838
0.039	341099.14338838
0.04	341099.14338838



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0.041	341099.14338838
0.042	341099.14338838
0.043	341099.14338838
0.044	341099.14338838
0.045	341099.14338838
0.046	341099.14338838
0.047	341099.14338838
0.048	341099.14338838
0.049	341099.14338838
0.05	341099.14338838
0.051	341099.14338838
0.052	341099.14338838
0.053	341099.14338838
0.054	341099.14338838
0.055	341099.14338838



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0.056	341099.14338838
0.057	341099.14338838
0.058	341099.14338838
0.059	341099.14338838
0.06	341099.14338838
0.061	341099.14338838
0.062	341099.14338838
0.063	341099.14338838
0.064	341099.14338838
0.065	341099.14338838
0.066	341099.14338838
0.067	341099.14338838
0.068	341099.14338838
0.069	341099.14338838
0.07	341099.14338838



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0.071	341099.14338838
0.072	341099.14338838
0.073	341099.14338838
0.074	341099.14338838
0.075	341099.14338838
0.076	341099.14338838
0.077	341099.14338838
0.078	341099.14338838
0.079	341099.14338838
0.08	341099.14338838
0.081	341099.14338838
0.082	341099.14338838
0.083	341099.14338838
0.084	341099.14338838
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