

Pyomo Joplin Results Before Any Change (8/29/21)

Some Changes I had to make –

These are not actually “changes”. More like opting to solve with Gurobi instead of NEOS

- Had to set `modelSolver=2` because it’s not working for the NEOS or GLPK solvers
- In the line `modelSolverSetting=pyo.SolverFactory('gurobi', solver_io="python")`, I had to add the `solver_io="python"` part because it threw an error otherwise

```
Academic license - for non-commercial use only - expires 2021-08-31
Using license file /Library/gurobi/gurobi.lic
Initial solve for objective function 1 complete.
Economic Loss: 1149.9829123410057 Dislocation: 1445967.606728603 Functionality: 0.987131774039447
Elapsed time for initial obj 1 solve: 1.4813697338104248

Initial solve for objective function 2 starting.
Initial solve for objective function 2 complete.
Economic Loss: 1149.9829123455943 Dislocation: 1066237.962604745 Functionality: 0.9863524096400202
Elapsed time for initial obj 2 solve: 1.2985990047454834

Initial solve for objective function 3 starting.
Initial solve for objective function 3 complete.
Economic Loss: 1266.3473069872177 Dislocation: 1438177.9661349955 Functionality: 0.998279765881102
Elapsed time for initial obj 3 solve: 1.3210692405700684
Max Budget: $ 519.3642245220001
Available Budget: $ 103.87284490440003

Economic loss min epsilon (optimal value): 1149.9829123410057
Dislocation when optimizing Economic Loss: 1445967.606728603
Functionality when optimizing Economic Loss: 0.987131774039447

Dislocation min epsilon (optimal value): 1066237.962604745
Economic Loss when optimizing Dislocation: 1149.9829123455943
Functionality when optimizing Dislocation: 0.9863524096400202

Functionality max epsilon (optimal value): 0.998279765881102
Economic Loss when optimizing Functionality: 1266.3473069872177
Dislocation when optimizing Functionality: 1438177.9661349955
Objective 1 max epsilon: 1266.3473069872177
Objective 1 min epsilon: 1149.9829123410057

Objective 2 max epsilon: 1445967.606728603
Objective 2 min epsilon: 1066237.962604745

Objective 3 max epsilon: 0.998279765881102
Objective 3 min epsilon: 0.9863524096400202
```

****OPTIMIZING ECONOMIC LOSS SUBJECT TO POPULATION DISLOCATION EPSILON CONSTRAINTS****

Step 1 : 1066237.962604745
Step 2 : 1086223.733348106
Step 3 : 1106209.504091467
Step 4 : 1126195.274834828
Step 5 : 1146181.045578189
Step 6 : 1166166.81632155
Step 7 : 1186152.587064911
Step 8 : 1206138.357808272
Step 9 : 1226124.1285516329
Step 10 : 1246109.8992949938
Step 11 : 1266095.6700383548
Step 12 : 1286081.4407817158
Step 13 : 1306067.2115250768
Step 14 : 1326052.9822684377
Step 15 : 1346038.7530117987
Step 16 : 1366024.5237551597
Step 17 : 1386010.2944985207
Step 18 : 1405996.0652418816
Step 19 : 1425981.8359852426
Step 20 : 1445967.6067286036

	Dislocation	Epsilon	Econ Loss	Results	Dislocation	Value	\
0	1.066238e+06		1149.982912		1.066238e+06		
1	1.086224e+06		1149.982912		1.086224e+06		
2	1.106210e+06		1149.982912		1.106210e+06		
3	1.126195e+06		1149.982912		1.126195e+06		
4	1.146181e+06		1149.982912		1.146181e+06		
5	1.166167e+06		1149.982912		1.166167e+06		
6	1.186153e+06		1149.982912		1.186153e+06		
7	1.206138e+06		1149.982912		1.206138e+06		
8	1.226124e+06		1149.982912		1.226124e+06		
9	1.246110e+06		1149.982912		1.246110e+06		
10	1.266096e+06		1149.982912		1.265793e+06		
11	1.286081e+06		1149.982912		1.286081e+06		
12	1.306067e+06		1149.982912		1.306067e+06		
13	1.326053e+06		1149.982912		1.326053e+06		
14	1.346039e+06		1149.982912		1.346039e+06		
15	1.366025e+06		1149.982912		1.366025e+06		
16	1.386010e+06		1149.982912		1.386010e+06		
17	1.405996e+06		1149.982912		1.405996e+06		

Step 18 : 1405996.0652418816
Step 19 : 1425981.8359852426
Step 20 : 1445967.6067286036

	Dislocation	Epsilon	Econ	Loss	Results	Dislocation	Value	\
0	1.066238e+06			1149.982912		1.066238e+06		
1	1.086224e+06			1149.982912		1.086224e+06		
2	1.106210e+06			1149.982912		1.106210e+06		
3	1.126195e+06			1149.982912		1.126195e+06		
4	1.146181e+06			1149.982912		1.146181e+06		
5	1.166167e+06			1149.982912		1.166167e+06		
6	1.186153e+06			1149.982912		1.186153e+06		
7	1.206138e+06			1149.982912		1.206138e+06		
8	1.226124e+06			1149.982912		1.226124e+06		
9	1.246110e+06			1149.982912		1.246110e+06		
10	1.266096e+06			1149.982912		1.265793e+06		
11	1.286081e+06			1149.982912		1.286081e+06		
12	1.306067e+06			1149.982912		1.306067e+06		
13	1.326053e+06			1149.982912		1.326053e+06		
14	1.346039e+06			1149.982912		1.346039e+06		
15	1.366025e+06			1149.982912		1.366025e+06		
16	1.386010e+06			1149.982912		1.386010e+06		
17	1.405996e+06			1149.982912		1.405996e+06		
18	1.425982e+06			1149.982912		1.415849e+06		
19	1.445968e+06			1149.982912		1.415849e+06		

	Functionality	Value
0		0.986352
1		0.986337
2		0.986770
3		0.986900
4		0.986557
5		0.986576
6		0.986582
7		0.986513
8		0.986429
9		0.986450
10		0.986359
11		0.986424
12		0.987011

```

13      0.987277
14      0.987359
15      0.987341
16      0.987344
17      0.987336
18      0.987338
19      0.987338
Elapsed time: 29.054666996002197
****OPTIMIZING ECONOMIC LOSS SUBJECT TO BUILDING FUNCTIONALITY EPSILON CONSTRAINTS****
Step  1 : 0.9863524096400202
Step  2 : 0.9869801652316561
Step  3 : 0.987607920823292
Step  4 : 0.9882356764149278
Step  5 : 0.9888634320065637
Step  6 : 0.9894911875981995
Step  7 : 0.9901189431898354
Step  8 : 0.9907466987814713
Step  9 : 0.9913744543731071
Step 10 : 0.992002209964743
Step 11 : 0.9926299655563788
Step 12 : 0.9932577211480147
Step 13 : 0.9938854767396506
Step 14 : 0.9945132323312864
Step 15 : 0.9951409879229223
Step 16 : 0.9957687435145581
Step 17 : 0.996396499106194
Step 18 : 0.9970242546978298
Step 19 : 0.9976520102894657
Step 20 : 0.9982797658811016

    Functionality Epsilon Econ Loss Results Dislocation Value \
0      0.986352   1149.982912  1.381950e+06
1      0.986980   1149.982912  1.389135e+06
2      0.987608   1149.982912  1.377441e+06
3      0.988236   1149.982912  1.371294e+06
4      0.988863   1149.982912  1.349763e+06
5      0.989491   1149.982912  1.354548e+06
6      0.990119   1149.982912  1.380182e+06
7      0.990747   1149.982912  1.396475e+06
8      0.991374   1149.982912  1.359757e+06
9      0.992002   1149.982912  1.359697e+06

```

10	0.992630	1149.982912	1.362133e+06
11	0.993258	1149.982912	1.380433e+06
12	0.993885	1149.982912	1.355843e+06
13	0.994513	1149.982912	1.374063e+06
14	0.995141	1149.982912	1.356534e+06
15	0.995769	1149.982912	1.332618e+06
16	0.996396	1150.994866	1.311752e+06
17	0.997024	1156.236985	1.315401e+06
18	0.997652	1173.452293	1.327079e+06
19	0.998280	1266.347307	1.438178e+06

Functionality	Value
0	0.989592
1	0.989202
2	0.991629
3	0.990647
4	0.990990
5	0.991324
6	0.991033
7	0.991105
8	0.992613
9	0.992002
10	0.993057
11	0.993683
12	0.994952
13	0.994513
14	0.995141
15	0.995776
16	0.996396
17	0.997024
18	0.997652
19	0.998280

Elapsed time: 29.84731411933899

****OPTIMIZING POPULATION DISLOCATION SUBJECT TO ECONOMIC LOSS EPSILON CONSTRAINTS****

Step 1 : 1149.9829123410057
 Step 2 : 1156.1073541644905
 Step 3 : 1162.2317959879754
 Step 4 : 1168.3562378114602
 Step 5 : 1174.480679634945
 Step 6 : 1180.60512145843

Step 7 : 1186.7295632819148
 Step 8 : 1192.8540051053997
 Step 9 : 1198.9784469288845
 Step 10 : 1205.1028887523694
 Step 11 : 1211.2273305758542
 Step 12 : 1217.351772399339
 Step 13 : 1223.476214222824
 Step 14 : 1229.6006560463088
 Step 15 : 1235.7250978697937
 Step 16 : 1241.8495396932785
 Step 17 : 1247.9739815167634
 Step 18 : 1254.0984233402482
 Step 19 : 1260.222865163733
 Step 20 : 1266.347306987218

	Econ	Loss	Epsilon	Dislocation	Results	Econ	Loss	Value	\
0	1149.982912				1.066238e+06	1149.982912			
1	1156.107354				1.066238e+06	1149.982912			
2	1162.231796				1.066238e+06	1149.982912			
3	1168.356238				1.066238e+06	1149.982912			
4	1174.480680				1.066238e+06	1149.982912			
5	1180.605121				1.066238e+06	1149.982912			
6	1186.729563				1.066238e+06	1149.982912			
7	1192.854005				1.066238e+06	1149.982912			
8	1198.978447				1.066238e+06	1149.982912			
9	1205.102889				1.066238e+06	1149.982912			
10	1211.227331				1.066238e+06	1149.982912			
11	1217.351772				1.066238e+06	1149.982912			
12	1223.476214				1.066238e+06	1149.982912			
13	1229.600656				1.066238e+06	1149.982912			
14	1235.725098				1.066238e+06	1149.982912			
15	1241.849540				1.066238e+06	1149.982912			
16	1247.973982				1.066238e+06	1149.982912			
17	1254.098423				1.066238e+06	1149.982912			
18	1260.222865				1.066238e+06	1149.982912			
19	1266.347307				1.066238e+06	1149.982912			

	Functionality	Value
0		0.986352
1		0.986352
2		0.986352

```
3      0.986352
4      0.986352
5      0.986352
6      0.986352
7      0.986352
8      0.986352
9      0.986352
10     0.986352
11     0.986352
12     0.986352
13     0.986352
14     0.986352
15     0.986352
16     0.986352
17     0.986352
18     0.986352
19     0.986352
Elapsed time: 31.418534994125366
***OPTIMIZING POPULATION DISLOCATION SUBJECT TO BUILDING FUNCTIONALITY EPSILON CONSTRAINTS****
Step 1 : 0.9863524096400202
Step 2 : 0.9869801652316561
Step 3 : 0.987607920823292
Step 4 : 0.9882356764149278
Step 5 : 0.9888634320065637
Step 6 : 0.9894911875981995
Step 7 : 0.9901189431898354

Step 8 : 0.9907466987814713
Step 9 : 0.9913744543731071
Step 10 : 0.992002209964743
Step 11 : 0.9926299655563788
Step 12 : 0.9932577211480147
Step 13 : 0.9938854767396506
Step 14 : 0.9945132323312864
Step 15 : 0.9951409879229223
Step 16 : 0.9957687435145581
Step 17 : 0.996396499106194
Step 18 : 0.9970242546978298
Step 19 : 0.9976520102894657
Step 20 : 0.9982797658811016
```

	Functionality	Epsilon	Dislocation	Results	Econ	Loss	Value	\
0		0.986352		1.066238e+06		1149.	982912	
1		0.986980		1.066412e+06		1149.	982912	
2		0.987608		1.066783e+06		1150.	100985	
3		0.988236		1.067346e+06		1150.	252496	
4		0.988863		1.068057e+06		1150.	538484	
5		0.989491		1.068972e+06		1151.	036947	
6		0.990119		1.070154e+06		1151.	437136	
7		0.990747		1.071504e+06		1152.	044446	
8		0.991374		1.072985e+06		1152.	407496	
9		0.992002		1.074828e+06		1153.	136753	
10		0.992630		1.077313e+06		1154.	281473	
11		0.993258		1.080755e+06		1156.	632112	
12		0.993885		1.085387e+06		1159.	055998	
13		0.994513		1.092595e+06		1162.	480234	
14		0.995141		1.102450e+06		1167.	001921	
15		0.995769		1.116104e+06		1172.	762625	
16		0.996396		1.134346e+06		1178.	378639	
17		0.997024		1.160256e+06		1190.	067268	
18		0.997652		1.206089e+06		1208.	087167	
19		0.998280		1.438178e+06		1266.	347307	

	Functionality	Value
0		0.986352
1		0.986980
2		0.987608
3		0.988236
4		0.988863
5		0.989491
6		0.990119
7		0.990747
8		0.991374
9		0.992002
10		0.992630
11		0.993258
12		0.993885
13		0.994513
14		0.995141
15		0.995769
16		0.996396

```

17          0.997024
18          0.997652
19          0.998280
Elapsed time: 30.50494885444641
****OPTIMIZING BUILDING FUNCTIONALITY SUBJECT TO ECONOMIC LOSS EPSILON CONSTRAINTS****
Step 1 : 1149.9829123410057
Step 2 : 1156.1073541644905
Step 3 : 1162.2317959879754
Step 4 : 1168.3562378114602
Step 5 : 1174.480679634945
Step 6 : 1180.60512145843
Step 7 : 1186.7295632819148
Step 8 : 1192.8540051053997
Step 9 : 1198.9784469288845
Step 10 : 1205.1028887523694
Step 11 : 1211.2273305758542
Step 12 : 1217.351772399339
Step 13 : 1223.476214222824
Step 14 : 1229.6006560463088
Step 15 : 1235.7250978697937
Step 16 : 1241.8495396932785
Step 17 : 1247.9739815167634
Step 18 : 1254.0984233402482
Step 19 : 1260.222865163733
Step 20 : 1266.347306987218

      Econ Loss Epsilon  Functionality Results  Econ Loss Value \
0        1149.982912          0.996021    1149.982912
1        1156.107354          0.997015    1156.107354
2        1162.231796          0.997330    1162.231796
3        1168.356238          0.997526    1168.356238
4        1174.480680          0.997674    1174.480680
5        1180.605121          0.997792    1180.605121
6        1186.729563          0.997885    1186.729563
7        1192.854005          0.997963    1192.854005
8        1198.978447          0.998026    1198.978447
9        1205.102889          0.998077    1205.102889
10       1211.227331          0.998118    1211.227331
11       1217.351772          0.998155    1217.351772
12       1223.476214          0.998186    1223.476214
13       1229.600656          0.998214    1229.600656

```

14	1235.725098	0.998235	1235.725098
15	1241.849540	0.998252	1241.849540
16	1247.973982	0.998265	1247.973982
17	1254.098423	0.998274	1254.098423
18	1260.222865	0.998278	1260.222865
19	1266.347307	0.998280	1266.238292

Dislocation Value

0	1.310777e+06
1	1.315519e+06
2	1.322743e+06
3	1.323142e+06
4	1.327505e+06
5	1.342295e+06
6	1.348527e+06
7	1.368367e+06
8	1.375638e+06
9	1.380822e+06
10	1.387162e+06
11	1.404262e+06
12	1.413067e+06
13	1.420222e+06
14	1.424739e+06
15	1.427750e+06
16	1.430672e+06
17	1.434181e+06
18	1.436922e+06
19	1.438358e+06

Elapsed time: 30.100719928741455

****OPTIMIZING BUILDING FUNCTIONALITY SUBJECT TO POPULATION DISLOCATION EPSILON CONSTRAINTS****

Step 1 :	1066237.962604745
Step 2 :	1086223.733348106
Step 3 :	1106209.504091467
Step 4 :	1126195.274834828
Step 5 :	1146181.045578189
Step 6 :	1166166.81632155
Step 7 :	1186152.587064911
Step 8 :	1206138.357808272
Step 9 :	1226124.1285516329
Step 10 :	1246109.8992949938

Step	11	:	1266095.6700383548
Step	12	:	1286081.4407817158
Step	13	:	1306067.2115250768
Step	14	:	1326052.9822684377
Step	15	:	1346038.7530117987
Step	16	:	1366024.5237551597
Step	17	:	1386010.2944985207
Step	18	:	1405996.0652418816
Step	19	:	1425981.8359852426
Step	20	:	1445967.6067286036
			Dislocation Epsilon Functionality Results Econ Loss Value \
0		1.066238e+06	0.986352 1149.982912
1		1.086224e+06	0.993978 1159.247510
2		1.106210e+06	0.995331 1168.805234
3		1.126195e+06	0.996130 1175.913559
4		1.146181e+06	0.996718 1184.390227
5		1.166167e+06	0.997134 1192.839590
6		1.186153e+06	0.997427 1200.570273
7		1.206138e+06	0.997653 1208.119157
8		1.226124e+06	0.997809 1218.724931
9		1.246110e+06	0.997914 1223.600581
10		1.266096e+06	0.997991 1229.501428
11		1.286081e+06	0.998055 1236.103288
12		1.306067e+06	0.998107 1240.066698
13		1.326053e+06	0.998145 1243.206938
14		1.346039e+06	0.998178 1247.177675
15		1.366025e+06	0.998209 1248.993479
16		1.386010e+06	0.998238 1252.058449
17		1.405996e+06	0.998258 1256.826366
18		1.425982e+06	0.998274 1263.234044
19		1.445968e+06	0.998280 1266.310491
			Dislocation Value
0		1.066238e+06	
1		1.086224e+06	
2		1.106210e+06	
3		1.126195e+06	
4		1.146181e+06	
5		1.166167e+06	
6		1.186153e+06	

```
7      1.206138e+06
8      1.226124e+06
9      1.246110e+06
10     1.266096e+06
11     1.286081e+06
12     1.306067e+06
13     1.326053e+06
14     1.346039e+06
15     1.366025e+06
16     1.386010e+06
17     1.405996e+06
18     1.425982e+06
19     1.438188e+06
Elapsed time: 30.68620800971985
***OPTIMIZING ECONOMIC LOSS SUBJECT TO POPULATION DISLOCATION AND BUILDING FUNCTIONALITY EPSILON CONSTRAINTS****
Step 1 e: 1066237.962604745 e2: 0.9863524096400202
Step 2 e: 1066237.962604745 e2: 0.9869801652316561
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 3 e: 1066237.962604745 e2: 0.987607920823292
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 4 e: 1066237.962604745 e2: 0.9882356764149278
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 5 e: 1066237.962604745 e2: 0.9888634320065637
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
. . .
```

```
infeasible
Step 6 e: 1066237.962604745 e2: 0.9894911875981995
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 7 e: 1066237.962604745 e2: 0.9901189431898354
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 8 e: 1066237.962604745 e2: 0.9907466987814713
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 9 e: 1066237.962604745 e2: 0.9913744543731071
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 10 e: 1066237.962604745 e2: 0.992002209964743
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 11 e: 1066237.962604745 e2: 0.9926299655563788
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 12 e: 1066237.962604745 e2: 0.9932577211480147
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
```

```
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 13 e: 1066237.962604745 e2: 0.9938854767396506
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 14 e: 1066237.962604745 e2: 0.9945132323312864
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 15 e: 1066237.962604745 e2: 0.9951409879229223
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 16 e: 1066237.962604745 e2: 0.9957687435145581
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 17 e: 1066237.962604745 e2: 0.996396499106194
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 18 e: 1066237.962604745 e2: 0.9970242546978298
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
- termination condition: infeasible
- message from solver: <undefined>
infeasible
Step 19 e: 1066237.962604745 e2: 0.9976520102894657
```

```

WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 20 e: 1066237.962604745   e2: 0.9982797658811016
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 21 e: 1086223.733348106   e2: 0.9863524096400202
Step 22 e: 1086223.733348106   e2: 0.9869801652316561
Step 23 e: 1086223.733348106   e2: 0.987607920823292
Step 24 e: 1086223.733348106   e2: 0.9882356764149278
Step 25 e: 1086223.733348106   e2: 0.9888634320065637
Step 26 e: 1086223.733348106   e2: 0.9894911875981995
Step 27 e: 1086223.733348106   e2: 0.9901189431898354
Step 28 e: 1086223.733348106   e2: 0.9907466987814713
Step 29 e: 1086223.733348106   e2: 0.9913744543731071
Step 30 e: 1086223.733348106   e2: 0.992002209964743
Step 31 e: 1086223.733348106   e2: 0.9926299655563788
Step 32 e: 1086223.733348106   e2: 0.9932577211480147
Step 33 e: 1086223.733348106   e2: 0.9938854767396506
Step 34 e: 1086223.733348106   e2: 0.9945132323312864
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 35 e: 1086223.733348106   e2: 0.9951409879229223
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible
  - message from solver: <undefined>
infeasible
Step 36 e: 1086223.733348106   e2: 0.9957687435145581
WARNING: Loading a SolverResults object with a warning status into
model.name="unknown";
  - termination condition: infeasible

```





