

The europe data

March 18, 2011

The data:

```
Amsterdam,0,3082,1639,649,280,904,1180,1014,494,1782,1323,875,515,973,1835,1196
Athens,3082,0,3312,2552,2562,3414,3768,2692,3099,3940,2997,2210,3140,2198,2551,1886
Barcelona,1639,3312,0,1899,1539,2230,2181,758,1512,628,515,1349,1125,1679,1471,1989
Berlin,649,2552,1899,0,575,743,1727,1141,1059,2527,1584,604,1094,354,1573,666
Cologne,280,2562,1539,575,0,730,1206,765,538,1776,1208,592,508,659,1586,915
Copenhagen,904,3414,2230,743,730,0,1864,1531,1196,2597,1914,1204,1329,1033,2352,1345
Edinburgh,1180,3768,2181,1727,1206,1864,0,1536,656,2372,1860,1743,1082,1872,2467,2098
Geneva,1014,2692,758,1141,765,1531,1536,0,867,1386,443,591,546,954,1093,1055
London,494,3099,1512,1059,538,1196,656,867,0,1704,1192,1075,414,1204,1799,912
Madrid,1782,3940,628,2527,1776,2597,2372,1386,1704,0,1143,1877,1268,2307,2099,2617
Marseille,1323,2997,515,1584,1208,1914,1860,443,1192,1143,0,1034,809,1397,856,1414
Munich,875,2210,1349,604,592,1204,1743,591,1075,1877,1034,0,827,363,969,458
Paris,515,3140,1125,1094,508,1329,1082,546,414,1268,809,827,0,1094,1531,1285
Prague,973,2198,1679,354,659,1033,1872,954,1204,2307,1397,363,1094,0,1370,312
Rome,1835,2551,1471,1573,1586,2352,2467,1093,1799,2099,856,969,1531,1370,0,1168
Vienna,1196,1886,1989,666,915,1345,2098,1055,912,2617,1414,458,1285,312,1168,0
```

The SAS code and output:

```
options linesize=70 pagesize=30;

data euro(type=distance);
  infile "europe.dat" delimiter=",";
  input city $ Amsterdam Athens
         Barcelona Berlin Cologne Copenhagen Edinburgh Geneva London
         Madrid Marseille Munich Paris Prague Rome Vienna;

proc mds level=absolute out=y outres=z;

proc print data=y;

proc sort data=z;
  by residual;
```

```

proc print data=z;
  var _row_ _col_ residual;

proc plot data=y;
  plot dim1 * dim2 $ _label_;

proc plot data=y;
  plot dim2*dim1 $ _label_;

```

Multidimensional Scaling: Data=WORK.EURO.DATA
 Shape=TRIANGLE Condition=MATRIX Level=ABSOLUTE
 Coef=IDENTITY Dimension=2 Formula=1 Fit=1
 Gconverge=0.01 Maxiter=100 Over=1 Ridge=0.0001

Iteration	Type	Badness- of-Fit Criterion	Change in Criterion	Convergence Measure
0	Initial	0.1096	.	0.7201
1	Lev-Mar	0.0754	0.0342	0.1298
2	Gau-New	0.0747	0.000655	0.008470

Convergence criterion is satisfied.

	D	M					
	I	A		L			
	M	T	T	A	N		
	E	R	Y	B	A	D	D
0	N	I	P	E	M	i	i
b	S	X	E	L	E	m	m
s	-	-	-	-	-	1	2
1	2	.	CRITERION			0.07	.
2	2	.	CONFIG	Amsterdam	Amsterdam	-300.71	558.62
3	2	.	CONFIG	Athens	Athens	2599.74	-375.74
4	2	.	CONFIG	Barcelona	Barcelona	-704.34	-1012.29
5	2	.	CONFIG	Berlin	Berlin	402.29	619.72
6	2	.	CONFIG	Cologne	Cologne	-83.70	396.98
7	2	.	CONFIG	Copenhagen	Copenhagen	97.17	1241.96
8	2	.	CONFIG	Edinburgh	Edinburgh	-1232.60	906.77
9	2	.	CONFIG	Geneva	Geneva	-185.99	-342.22
10	2	.	CONFIG	London	London	-574.43	406.08

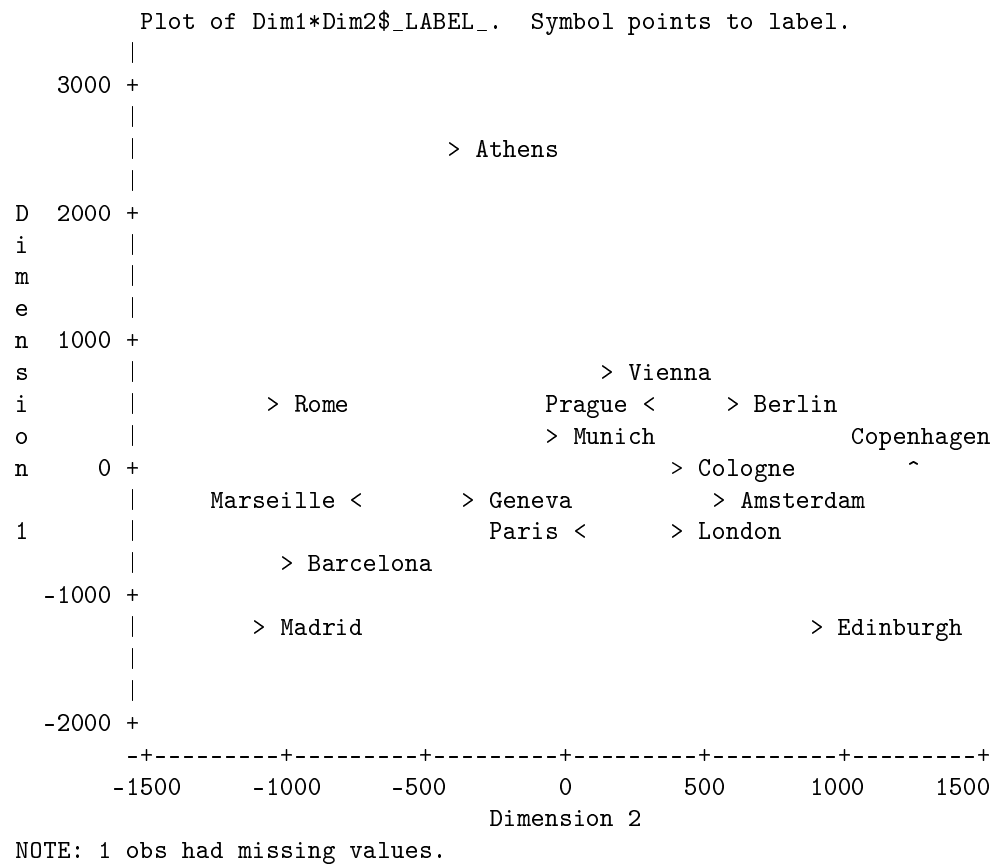
11	2	.	CONFIG	Madrid	Madrid	-1341.37	-1088.16
12	2	.	CONFIG	Marseille	Marseille	-319.76	-750.10
13	2	.	CONFIG	Munich	Munich	326.13	-25.17
14	2	.	CONFIG	Paris	Paris	-525.60	49.92
15	2	.	CONFIG	Prague	Prague	541.20	285.90
16	2	.	CONFIG	Rome	Rome	541.38	-1031.08
17	2	.	CONFIG	Vienna	Vienna	760.58	158.80

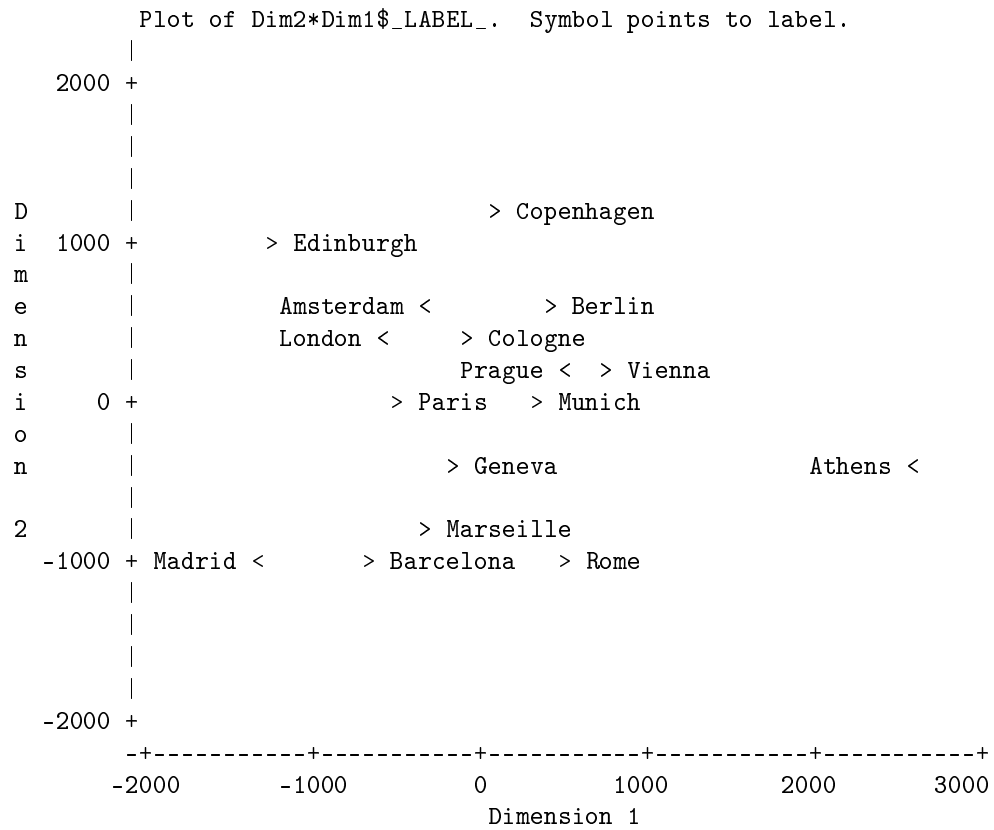
Obs	_ROW_	_COL_	RESIDUAL
1	Vienna	London	-445.723
2	Edinburgh	Athens	-273.247
3	Cologne	Athens	-230.477
4	London	Edinburgh	-170.966
5	Madrid	Cologne	-170.119
6	London	Athens	-170.038
7	Madrid	Amsterdam	-166.039
8	Copenhagen	Barcelona	-162.500
9	Rome	Edinburgh	-160.213
10	Madrid	Copenhagen	-141.406
11	Copenhagen	Cologne	-134.123
12	Paris	Madrid	-132.258
13	Marseille	Copenhagen	-121.224
14	Prague	Barcelona	-120.074
15	Munich	Madrid	-100.500
16	Geneva	Athens	-93.936
17	Geneva	Edinburgh	-93.524
18	Munich	Athens	-90.479
19	Geneva	Barcelona	-89.162
20	Rome	Berlin	-83.651
21	Munich	Copenhagen	-83.648
22	Geneva	Copenhagen	-78.284
23	Munich	Barcelona	-77.984
24	Munich	Edinburgh	-73.081
25	Berlin	Barcelona	-72.825
26	Madrid	Athens	-64.983
27	Rome	Munich	-59.684
28	Berlin	Amsterdam	-56.654

Obs	_ROW_	_COL_	RESIDUAL
29	Paris	Cologne	-53.8914
30	Barcelona	Athens	-52.8446
31	Edinburgh	Cologne	-50.9288
32	Rome	Marseille	-49.8122
33	Munich	Berlin	-45.3708
34	Vienna	Rome	-41.9072
35	Paris	Amsterdam	-41.1876

36	Marseille	Edinburgh	-31.6925
37	Vienna	Edinburgh	-30.9065
38	Vienna	Athens	-29.2629
39	Paris	Edinburgh	-28.8729
40	Paris	Munich	-28.0300
41	Prague	Madrid	-23.6872
42	Prague	Copenhagen	-21.1409
43	Rome	London	-20.4691
44	Paris	Marseille	-17.0810
45	Vienna	Geneva	-15.9936
46	Paris	Copenhagen	-15.9127
47	Prague	Munich	-15.1767
48	Paris	Athens	-14.1908
49	Vienna	Munich	-13.7999
50	Madrid	Barcelona	-13.5256
51	Munich	Geneva	-11.3201
52	Prague	Berlin	-7.5690
53	Prague	Edinburgh	-7.3210
54	Prague	Geneva	-6.9042
55	Vienna	Paris	-5.7802
56	Cologne	Barcelona	-0.8805
Obs	_ROW_	_COL_	RESIDUAL
57	Prague	Paris	1.4177
58	Vienna	Marseille	2.1783
59	Munich	Cologne	3.6420
60	Paris	Berlin	5.1273
61	Marseille	London	8.0969
62	Cologne	Amsterdam	9.4006
63	Madrid	Geneva	10.7449
64	Rome	Paris	12.1198
65	Geneva	Berlin	13.4360
66	Marseille	Geneva	13.7411
67	Marseille	Amsterdam	14.1403
68	Barcelona	Amsterdam	17.0667
69	Munich	Amsterdam	18.4138
70	Geneva	Cologne	18.7615
71	London	Geneva	23.8879
72	Prague	Cologne	24.3091
73	Madrid	London	24.4256
74	Rome	Cologne	27.1331
75	Paris	Geneva	27.2483
76	Athens	Amsterdam	34.7629
77	Marseille	Berlin	35.5280
78	Prague	Athens	35.7420
79	Rome	Copenhagen	35.9616

80	Rome	Amsterdam	36.0394
81	Marseille	Cologne	36.8831
82	Vienna	Cologne	37.7675
83	Cologne	Berlin	40.3989
84	London	Cologne	47.1817
Obs	_ROW_	_COL_	RESIDUAL
85	Paris	Barcelona	47.854
86	Marseille	Barcelona	49.544
87	Prague	Marseille	49.951
88	Copenhagen	Berlin	49.978
89	Rome	Prague	53.019
90	Marseille	Athens	53.598
91	Paris	London	54.506
92	Vienna	Prague	58.458
93	London	Berlin	59.188
94	Vienna	Amsterdam	61.891
95	Munich	Marseille	63.074
96	Marseille	Madrid	66.908
97	Edinburgh	Berlin	67.099
98	Vienna	Copenhagen	74.824
99	Munich	London	76.507
100	Prague	London	81.916
101	Vienna	Berlin	82.202
102	Madrid	Berlin	86.260
103	London	Barcelona	87.690
104	Prague	Amsterdam	88.019
105	Rome	Geneva	91.202
106	Geneva	Amsterdam	105.889
107	Copenhagen	Amsterdam	113.263
108	Vienna	Barcelona	113.509
109	London	Copenhagen	123.743
110	Berlin	Athens	139.590
111	Vienna	Madrid	173.003
112	London	Amsterdam	180.650
Obs	_ROW_	_COL_	RESIDUAL
113	Edinburgh	Amsterdam	185.201
114	Edinburgh	Barcelona	190.567
115	Rome	Madrid	215.393
116	Rome	Barcelona	225.139
117	Madrid	Edinburgh	374.108
118	Rome	Athens	390.827
119	Copenhagen	Athens	434.100
120	Edinburgh	Copenhagen	492.631





NOTE: 1 obs had missing values.