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Installation

download and install

```
clear; close all;
cd ./simu_functions/
addpath(genpath(pwd))
cd ../../..
addpath(genpath(pwd))
cd ../../../../pqnl1;
addpath(genpath(pwd))

cd ../experiments/help_spgl1/modifying/task16bpdn/seismic/simushots
rmpath('/Volumes/Users/linamiao/Dropbox/PQN/pqnl1/minConF/')
```

Data

Number of time samples

```
nt = 1024;
% Number of sources
ns = 178;
% Number of receivers
nr = 178;

% Time sampling interval
dt = 0.004;

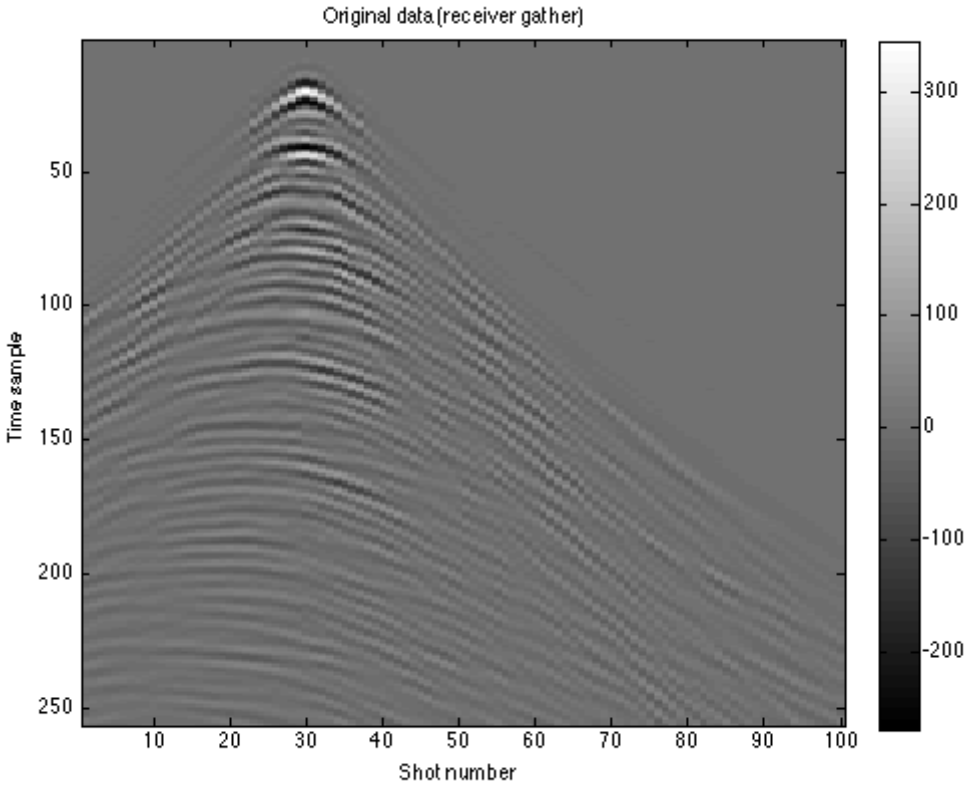
% Read data
D = ReadSuFast('GulfOfSuez178.su');
D = reshape(D,nt,nr,ns);

% Select small subset
D = D(1:256,30,1:100);

% Define new data sizes
[nt,nr,ns] = size(D);
```

```
% Vectorize D
D = D(:);

% Display
figure
imagesc(reshape(D,nt,ns)); colormap(gray); colorbar;
title('Original data (receiver gather)');
xlabel('Shot number'); ylabel('Time sample')
```

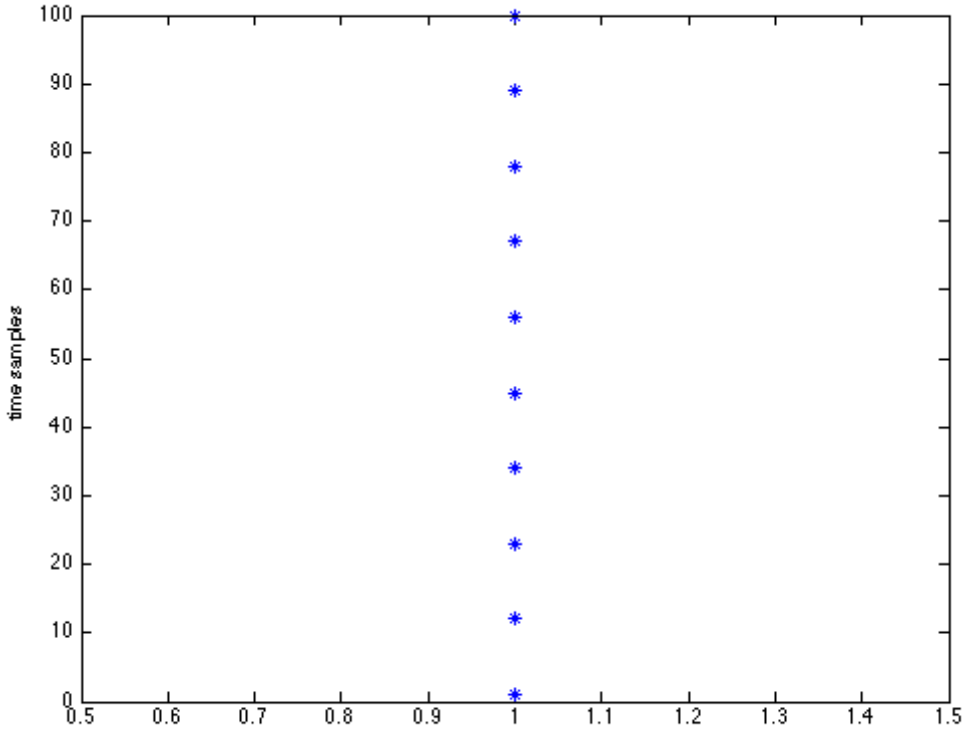


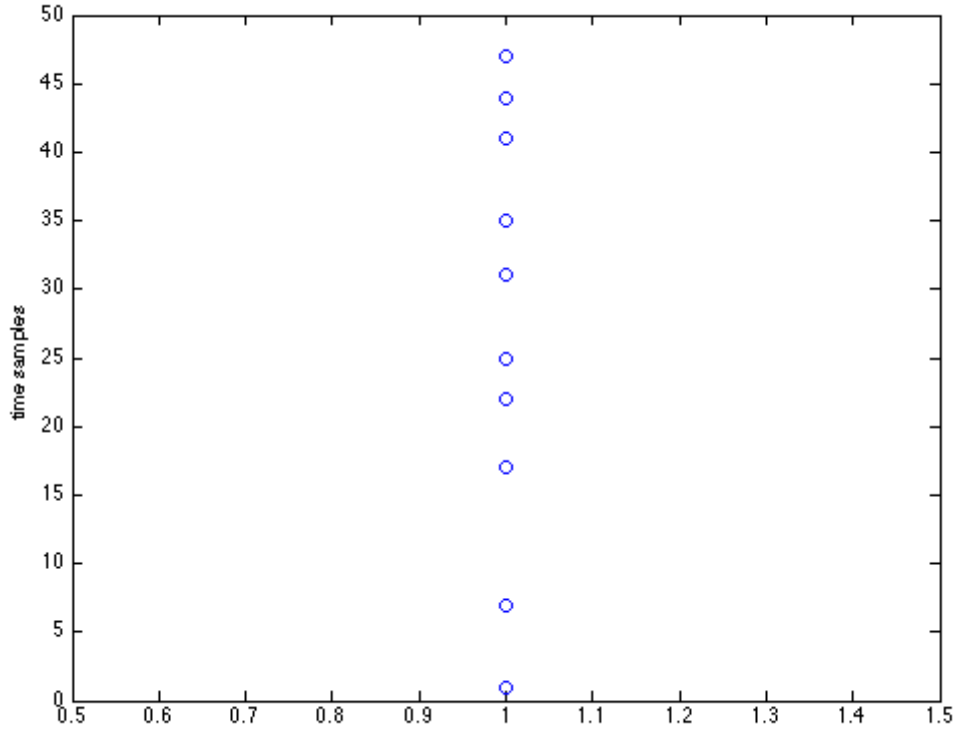
Set the patameters for randomized experiment

```
I  = eye(10);
RM1 = opSimSourceRandTimeDither([10 1 10], [5*10 1], 10);

% plot very long time series
figure;
plot(I(:),1:length(I(:)),'*');xlim([0.5 1.5]);ylabel('time samples');

% plot compressed series
figure;
plot(RM1*I(:),1:length(RM1*I(:)),'o');xlim([0.5 1.5]);ylabel('time samples');
```


time samples
100
90
80
70
60
50
40
30
20
10
0
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5


time samples
50
45
40
35
30
25
20
15
10
5
0
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5

Construct the sampling operator RM for p = 0.5 that works on the vectorized version of the data using opSimSourceRandTimeDither.

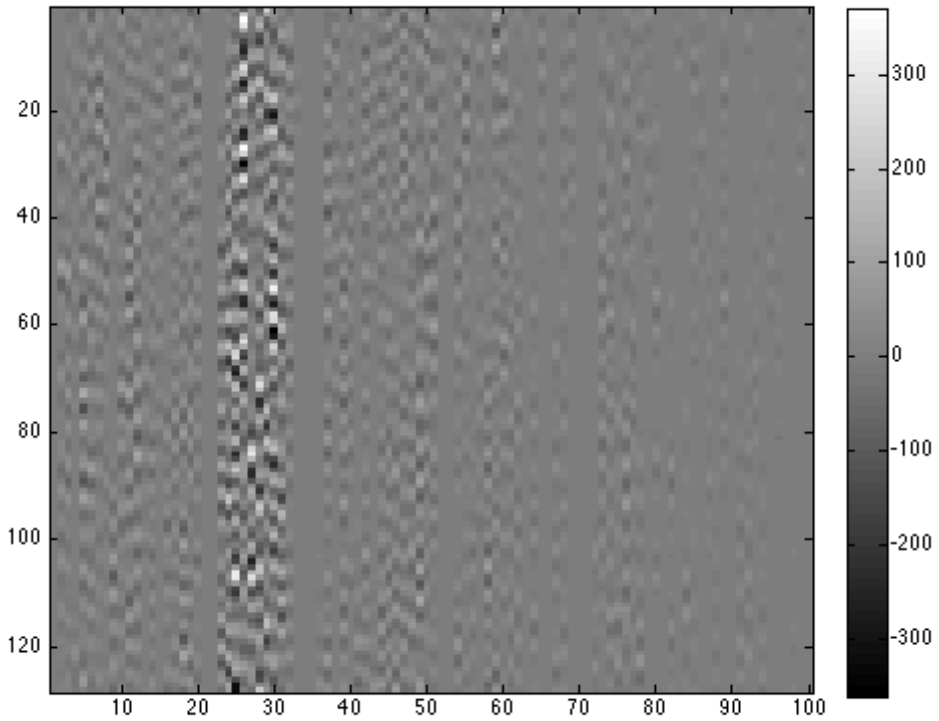
```
p = .5;
D_RM1 = opSimSourceRandTimeDither([nt,nr,ns],[p*nt*ns,1],ns);

% Test the sampling operator with the dottest.
x_test = rand(size(D_RM1,2),1);
y_test = rand(size(D_RM1,1),1);
left = y_test'*(D_RM1*x_test);
right = (D_RM1'*y_test)'*x_test;
error = norm(left-right);
fprintf('In dottest error:%5.5e\n',error);
```

```
In dottest error:1.81899e-12
```

Generate simultaneous data simD and display the result.

```
simD1 = D_RM1*D;
figure;
imagesc(reshape(simD1,p*nt,ns)); colormap(gray); colorbar;
```

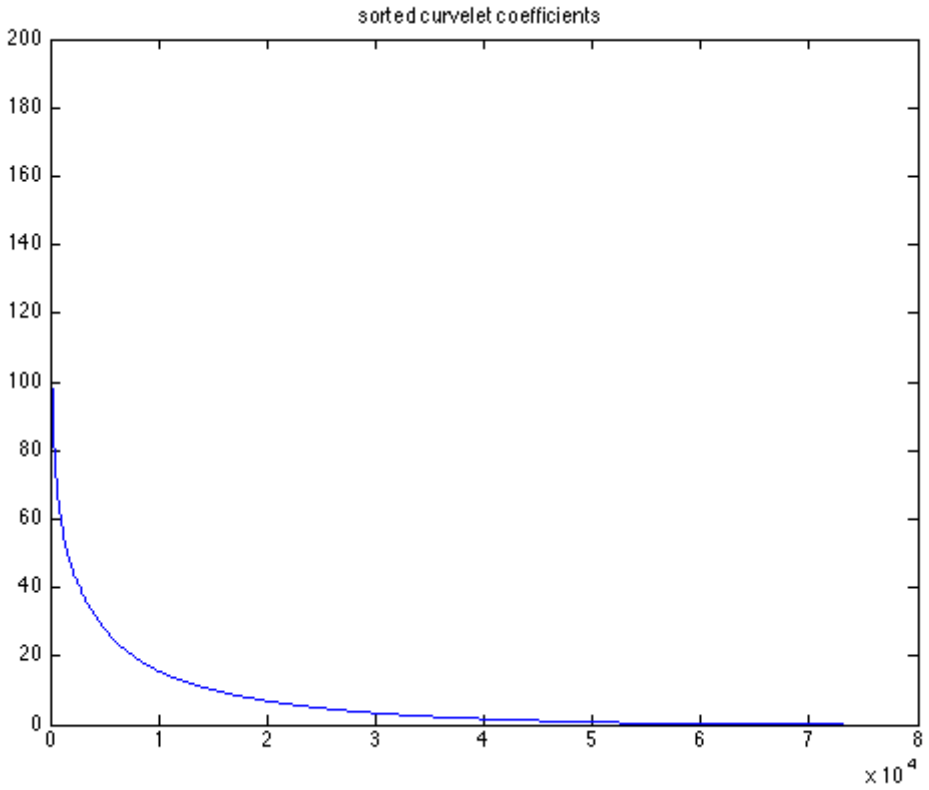


sparsifying transform

Use this to create a Curvelet SPOT operator:

```
C = opCurvelet(nt, ns);
```

```
% Transform the data into the Curvelet domain and plot the sorted coefficients
C_D = C*D;
sort_CD = sort(abs(C_D),'descend');
figure;plot(sort_CD);title('sorted curvelet coefficients')
```



exercises

Construct the measurement operator A. HINT: See 'Constructing a suitable matrix' in Lab 7. Using spgl1, estimate the curvelet coefficients xest.

```
fid = fopen('log.txt', 'w');
p_list = [.5];

p = p_list;
D_RM1 = opSimSourceRandTimeDither([nt,nr,ns],[p*nt*ns,1],ns);
simD1 = D_RM1*D;
A = D_RM1*C';

% options = spgSetParms('optTol', 1e-4, 'iterations', 1000);%, 'fid', fid);
% xestspg = spgl1(A,simD1,0,1e-3,[],options);
% tau = norm(xestspg,1);
tau = 2.2072179e+05;

options = spgSetParms('optTol', 1e-4, 'iterations', 200);%, 'fid', fid);
xinit = zeros(size(A,2),1);
```

```
which spgl1
%keyboard;
xestspg = spgl1(A,simD1,tau,[],xinit,options);
%options.iterations = 100;
xestpqn = pqnl1_2(A,simD1,tau,[],xinit,options);
fspg = C'*xestspg;
snrspg = SNR(D,fspg);
fpqn = C'*xestpqn;
snrpqn = SNR(D,fpqn);



figure;
subplot(1,2,1);imagesc(reshape(fspg,nt,ns)); colormap(gray);
title(strcat(['p = .5, SNR=' num2str(snrspg(1)) 'dB']))
subplot(1,2,2);imagesc(reshape(fspg-D,nt,ns)); colormap(gray);
title('difference')


figure;
subplot(1,2,1);imagesc(reshape(fpqn,nt,ns)); colormap(gray);
title(strcat(['p = .5, SNR=' num2str(snrpqn(1)) 'dB']))
subplot(1,2,2);imagesc(reshape(fpqn-D,nt,ns)); colormap(gray);
title('difference')

% BPDN
[x_spg,r_spg,g_spg,info_spg] = spgl1(A, simD1, 0, 0, zeros(size(A,2),1), options);

[x_pqn1,r_pqn1,g_pqn1,info_pqn1] = pqnl1_2(A, simD1, 0, 0, zeros(size(A,2),1), opt

figure; subplot(2,1,1);plot(x_spg);subplot(2,1,2);plot(x_pqn1);
info_spg
info_pqn1

% show result
figure('Name','Solution paths')
plot(info_spg.xNorm1,info_spg.rNorm2,info_pqn1.xNorm1,info_pqn1.rNorm2);hold on
scatter(info_spg.xNorm1,info_spg.rNorm2);
scatter(info_pqn1.xNorm1,info_pqn1.rNorm2);hold off
legend('SPGL1','PQNl1')
axis tight
```

```
        /Tools/mat_toolbox/spgl1-slim/spgl1.m

         ================================================================================
         SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
         ================================================================================
         No. rows              :    12800      No. columns           :    73051
         Initial tau           : 2.21e+05      Two-norm of b         : 4.31e+03
         Optimality tol        : 1.00e-04      Target one-norm of x  : 2.21e+05
         Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200
```

Iter	Objective	Relative Gap	gNorm	stepG	nnzX	nnzG
0	4.3069533e+03	5.8967216e+00	2.48e+02	0.0	0	0
1	4.2420265e+03	5.9749860e+00	2.45e+02	0.0	71470	0
2	1.8257003e+03	1.1749561e+01	9.88e+01	0.0	37599	0
3	1.4150218e+03	1.5558252e+01	8.53e+01	0.0	31094	0
4	1.2329135e+03	1.1010971e+01	5.05e+01	0.0	25126	0
5	1.1175889e+03	1.6197090e+01	5.84e+01	0.0	22276	0
6	1.0296047e+03	1.7434416e+01	5.28e+01	0.0	19544	0
7	9.7159395e+02	4.2286592e+01	1.01e+02	0.0	17935	0
8	9.3502103e+02	4.5834034e+01	1.00e+02	0.0	17049	0
9	8.7980918e+02	2.4668489e+01	5.32e+01	0.0	17000	0
10	8.5736147e+02	8.3299749e+00	2.36e+01	0.0	16167	0
11	8.2779071e+02	1.1454870e+01	2.72e+01	0.0	15374	0
12	7.6692048e+02	1.3340831e+02	1.85e+02	0.0	12103	0
13	7.1602699e+02	3.2744033e+01	4.56e+01	-0.3	13229	0
14	6.9713844e+02	6.6991969e+00	1.49e+01	0.0	13773	0
15	6.8848272e+02	6.9532672e+00	1.50e+01	0.0	13073	0
16	6.5187088e+02	2.6688460e+01	3.30e+01	0.0	11819	0
17	6.4576226e+02	4.4351496e+01	4.90e+01	-0.3	11998	0
18	6.4247644e+02	7.5575123e+01	7.77e+01	0.0	11838	0
19	6.3386622e+02	3.2953093e+01	3.70e+01	0.0	11750	0
20	6.2904869e+02	8.1762979e+00	1.43e+01	0.0	11679	0
21	6.2599229e+02	7.5809274e+00	1.37e+01	0.0	11581	0
22	6.0538284e+02	2.9480120e+01	3.11e+01	0.0	10943	0
23	6.0875289e+02	8.9222876e+01	8.15e+01	-0.3	11017	0
24	6.0333876e+02	8.4544653e+01	7.62e+01	0.0	11070	0
25	5.9302101e+02	6.9204063e+00	1.21e+01	0.0	11026	0
26	5.9134016e+02	6.9066169e+00	1.20e+01	0.0	10963	0
27	5.8068060e+02	1.4000542e+01	1.71e+01	0.0	10612	0
28	5.7634552e+02	5.4997338e+01	4.76e+01	-0.3	10631	0
29	5.8815231e+02	1.2177617e+02	1.02e+02	-0.3	10675	0
30	5.6761045e+02	2.8671588e+01	2.72e+01	0.0	10766	0
31	5.6520029e+02	6.5129510e+00	1.10e+01	0.0	10618	0
32	5.6367702e+02	6.5274506e+00	1.09e+01	0.0	10533	0
33	5.5287100e+02	7.7825749e+01	5.75e+01	0.0	7909	0
34	5.5877049e+02	1.6854450e+02	1.24e+02	-0.3	9869	0
35	5.2466238e+02	1.2837171e+02	8.50e+01	0.0	11276	0
36	5.0242903e+02	7.9708271e+00	9.60e+00	0.0	10742	0
37	5.0008855e+02	6.3447664e+00	8.66e+00	0.0	10407	0
38	4.9361287e+02	5.1022575e+00	7.98e+00	0.0	9822	0
39	4.8683826e+02	1.6870626e+01	1.43e+01	0.0	9290	0
40	4.9124876e+02	7.1845302e+01	4.45e+01	-0.3	9245	0
41	4.8424229e+02	2.3772851e+01	1.78e+01	-0.3	9490	0
42	4.8271996e+02	7.7955391e+00	9.29e+00	0.0	9350	0
43	4.8219178e+02	5.0347414e+00	7.83e+00	0.0	9262	0
44	4.8040599e+02	7.0161371e+00	8.82e+00	0.0	9081	0
45	4.8168144e+02	8.2297856e+01	4.84e+01	0.0	8740	0
46	4.7587503e+02	1.3279104e+01	1.19e+01	-0.3	9036	0
47	4.7422275e+02	7.3898257e+00	8.87e+00	0.0	9030	0
48	4.7361341e+02	4.9314629e+00	7.60e+00	0.0	8918	0
49	4.7211017e+02	9.4321587e+00	9.83e+00	0.0	8757	0
50	4.7330690e+02	7.2202080e+01	4.17e+01	0.0	8628	0
51	4.6984876e+02	9.0346539e+00	9.58e+00	-0.3	8868	0
52	4.6874681e+02	5.4873187e+00	7.77e+00	0.0	8824	0

53	4.6814397e+02	4.8542728e+00	7.44e+00	0.0	8705	0
54	4.6696420e+02	8.2392376e+00	9.08e+00	0.0	8593	0
55	4.6813442e+02	7.9611430e+01	4.45e+01	-0.3	8501	0
56	4.6463641e+02	4.5669159e+00	7.23e+00	-0.3	8634	0
57	4.6400022e+02	4.6101868e+00	7.23e+00	0.0	8619	0
58	4.6349499e+02	4.6532308e+00	7.24e+00	0.0	8541	0
59	4.6180437e+02	2.0143754e+01	1.47e+01	0.0	8466	0
60	4.6292457e+02	5.9192023e+01	3.37e+01	-0.3	8493	0
61	4.6247008e+02	6.0830214e+01	3.44e+01	0.0	8541	0
62	4.6037252e+02	7.4325664e+00	8.51e+00	0.0	8525	0
63	4.6018940e+02	4.6409852e+00	7.16e+00	0.0	8490	0
64	4.5957891e+02	4.7136275e+00	7.18e+00	0.0	8445	0
65	4.4852162e+02	4.4195120e+01	2.46e+01	0.0	7709	0
66	4.5587324e+02	1.3022975e+02	6.59e+01	-0.3	8215	0
67	4.4809524e+02	8.7715717e+01	4.45e+01	0.0	8634	0
68	4.4314644e+02	3.2814537e+00	6.11e+00	0.0	8476	0
69	4.4284653e+02	4.0879494e+00	6.47e+00	0.0	8370	0
70	4.4206076e+02	6.7752298e+00	7.66e+00	0.0	8196	0
71	4.4132209e+02	2.4602025e+01	1.55e+01	0.0	8042	0
72	4.4084822e+02	3.5445148e+00	6.24e+00	-0.3	8144	0
73	4.4052065e+02	3.4579965e+00	6.20e+00	0.0	8137	0
74	4.4022529e+02	3.3857364e+00	6.16e+00	0.0	8076	0
75	4.3916561e+02	1.0037556e+01	9.03e+00	0.0	7965	0
76	4.3910061e+02	2.4088313e+01	1.52e+01	-0.3	8006	0
77	4.3882974e+02	1.7875626e+01	1.24e+01	0.0	7999	0
78	4.3846833e+02	3.3250335e+00	6.10e+00	0.0	7994	0
79	4.3837004e+02	3.3257899e+00	6.10e+00	0.0	7978	0
80	4.3791093e+02	4.5056195e+00	6.60e+00	0.0	7937	0
81	4.3728899e+02	5.8952027e+01	3.01e+01	-0.3	7815	0
82	4.3649719e+02	1.9208018e+01	1.29e+01	-0.3	7965	0
83	4.3561835e+02	3.8374185e+00	6.26e+00	0.0	8000	0
84	4.3548948e+02	3.0345888e+00	5.91e+00	0.0	7954	0
85	4.3496544e+02	3.0663857e+00	5.92e+00	0.0	7887	0
86	4.3387290e+02	8.1111178e+00	8.05e+00	0.0	7805	0
87	4.3402270e+02	1.0930531e+01	9.23e+00	-0.3	7893	0
88	4.3386504e+02	3.1171401e+01	1.79e+01	0.0	7920	0
89	4.3323586e+02	1.0224342e+01	8.94e+00	0.0	7914	0
90	4.3306918e+02	3.0553479e+00	5.89e+00	0.0	7882	0
91	4.3299873e+02	3.0508691e+00	5.88e+00	0.0	7862	0
92	4.3167636e+02	5.4897980e+00	6.85e+00	0.0	7710	0
93	4.3151639e+02	1.7872188e+01	1.21e+01	-0.3	7811	0
94	4.3181522e+02	2.1178540e+01	1.35e+01	0.0	7893	0
95	4.3095852e+02	1.8500882e+01	1.23e+01	0.0	7944	0
96	4.3073804e+02	3.3600875e+00	5.97e+00	0.0	7881	0
97	4.3065578e+02	2.9790395e+00	5.81e+00	0.0	7840	0
98	4.3052707e+02	2.9359449e+00	5.79e+00	0.0	7781	0
99	4.2935676e+02	2.1380866e+01	1.35e+01	0.0	7657	0
100	4.2992740e+02	3.5194950e+01	1.93e+01	-0.3	7723	0
101	4.2902419e+02	1.9231022e+01	1.25e+01	0.0	7770	0
102	4.2879346e+02	2.5183147e+00	5.58e+00	0.0	7741	0
103	4.2873157e+02	2.4973746e+00	5.57e+00	0.0	7729	0
104	4.2830809e+02	2.3022870e+01	1.41e+01	0.0	7657	0
105	4.2847180e+02	2.2189624e+01	1.37e+01	-0.3	7692	0
106	4.2803522e+02	1.1742042e+01	9.39e+00	0.0	7715	0

107	4.2793262e+02	2.4801537e+00	5.55e+00	0.0	7696	0
108	4.2788294e+02	2.4742001e+00	5.55e+00	0.0	7687	0
109	4.2633332e+02	1.5382526e+01	1.08e+01	0.0	7578	0
110	4.2700001e+02	4.2145964e+01	2.19e+01	-0.3	7673	0
111	4.2633362e+02	2.8657430e+01	1.63e+01	0.0	7734	0
112	4.2577264e+02	2.4641295e+00	5.50e+00	0.0	7707	0
113	4.2567356e+02	3.5724683e+00	5.96e+00	0.0	7689	0
114	4.2553934e+02	2.3824547e+00	5.47e+00	0.0	7666	0
115	4.2521397e+02	2.8149709e+00	5.64e+00	0.0	7626	0
116	4.2497329e+02	2.6985686e+01	1.55e+01	-0.3	7590	0
117	4.2498399e+02	2.1863429e+01	1.34e+01	-0.3	7691	0
118	4.2433934e+02	1.4435730e+01	1.04e+01	0.0	7705	0
119	4.2420186e+02	2.4458616e+00	5.47e+00	0.0	7664	0
120	4.2414232e+02	2.7430266e+00	5.59e+00	0.0	7641	0
121	4.2384628e+02	8.3058343e+00	7.84e+00	0.0	7572	0
122	4.2372990e+02	5.6907124e+00	6.78e+00	-0.3	7610	0
123	4.2363886e+02	8.1398953e+00	7.78e+00	0.0	7587	0
124	4.2356152e+02	3.6032875e+00	5.93e+00	0.0	7585	0
125	4.2348252e+02	5.5338360e+00	6.71e+00	0.0	7573	0
126	4.2339396e+02	4.6631618e+00	6.36e+00	0.0	7566	0
127	4.2328565e+02	1.0843839e+01	8.86e+00	0.0	7558	0
128	4.2340372e+02	1.9642275e+01	1.24e+01	0.0	7559	0
129	4.2324860e+02	1.6317089e+01	1.11e+01	0.0	7572	0
130	4.2305344e+02	3.7790610e+00	5.99e+00	0.0	7572	0
131	4.2302043e+02	2.3956423e+00	5.43e+00	0.0	7564	0
132	4.2284720e+02	2.4178566e+00	5.44e+00	0.0	7548	0
133	4.2254115e+02	2.5317403e+01	1.47e+01	-0.3	7551	0
134	4.2278084e+02	2.1505949e+01	1.32e+01	-0.3	7587	0
135	4.2224089e+02	9.2723884e+00	8.19e+00	0.0	7619	0
136	4.2216553e+02	2.4120611e+00	5.42e+00	0.0	7586	0
137	4.2211555e+02	2.3963825e+00	5.41e+00	0.0	7572	0
138	4.2176544e+02	4.7919642e+00	6.37e+00	0.0	7522	0
139	4.2170996e+02	1.8214495e+01	1.18e+01	-0.3	7539	0
140	4.2179985e+02	2.1322170e+01	1.30e+01	-0.3	7549	0
141	4.2145664e+02	6.3787764e+00	7.01e+00	0.0	7558	0
142	4.2141544e+02	2.3775565e+00	5.40e+00	0.0	7541	0
143	4.2135575e+02	2.3732341e+00	5.39e+00	0.0	7528	0
144	4.2104639e+02	7.4182270e+00	7.41e+00	0.0	7498	0
145	4.2098869e+02	1.3743571e+01	9.95e+00	-0.3	7520	0
146	4.2096706e+02	1.5020956e+01	1.05e+01	0.0	7520	0
147	4.2081254e+02	5.8308894e+00	6.77e+00	0.0	7524	0
148	4.2076303e+02	2.7121073e+00	5.52e+00	0.0	7516	0
149	4.2072239e+02	2.3624888e+00	5.38e+00	0.0	7503	0
150	4.2007409e+02	2.4204968e+00	5.38e+00	0.0	7436	0
151	4.2009011e+02	1.9610295e+01	1.23e+01	-0.3	7473	0
152	4.2002179e+02	9.1201530e+00	8.05e+00	-0.3	7560	0
153	4.1967107e+02	8.8719753e+00	7.96e+00	0.0	7559	0
154	4.1960766e+02	3.4029252e+00	5.77e+00	0.0	7516	0
155	4.1955658e+02	2.2901882e+00	5.33e+00	0.0	7487	0
156	4.1927288e+02	4.0777328e+00	6.03e+00	0.0	7432	0
157	4.1918555e+02	1.1268845e+01	8.90e+00	-0.3	7447	0
158	4.1937112e+02	2.0385145e+01	1.25e+01	0.0	7442	0
159	4.1920202e+02	1.7775063e+01	1.15e+01	0.0	7457	0
160	4.1900458e+02	4.0415894e+00	6.02e+00	0.0	7455	0

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  161  4.1898003e+02  2.3044074e+00   5.32e+00     0.0    7447       0
  162  4.1886200e+02  3.3575393e+00   5.74e+00     0.0    7431       0
  163  4.1877664e+02  1.1289413e+01   8.89e+00    -0.3    7433       0
  164  4.1882062e+02  1.6102624e+01   1.08e+01    -0.3    7433       0
  165  4.1867000e+02  7.8002204e+00   7.50e+00     0.0    7428       0
  166  4.1861050e+02  2.2334614e+00   5.29e+00     0.0    7431       0
  167  4.1858491e+02  2.2375683e+00   5.29e+00     0.0    7425       0
  168  4.1806018e+02  3.6161430e+00   5.82e+00     0.0    7385       0
  169  4.1802765e+02  1.9951328e+01   1.23e+01    -0.3    7427       0
  170  4.1788943e+02  5.5564652e+00   6.59e+00    -0.3    7470       0
  171  4.1776010e+02  1.0670499e+01   8.61e+00     0.0    7445       0
  172  4.1771476e+02  2.2180272e+00   5.27e+00     0.0    7436       0
  173  4.1768088e+02  2.9860102e+00   5.57e+00     0.0    7426       0
  174  4.1737615e+02  1.2476103e+01   9.29e+00     0.0    7358       0
  175  4.1750785e+02  3.0290727e+01   1.64e+01    -0.3    7428       0
  176  4.1707738e+02  8.0501286e+00   7.55e+00     0.0    7441       0
  177  4.1697114e+02  2.1697802e+00   5.24e+00     0.0    7424       0
  178  4.1692383e+02  2.1618173e+00   5.23e+00     0.0    7406       0
  179  4.1682024e+02  1.7166448e+01   1.11e+01     0.0    7378       0
  180  4.1674449e+02  2.1586195e+00   5.23e+00    -0.3    7400       0
  181  4.1671149e+02  4.4874610e+00   6.14e+00     0.0    7389       0
  182  4.1666611e+02  2.1474996e+00   5.22e+00     0.0    7383       0
  183  4.1644917e+02  2.1431467e+00   5.22e+00     0.0    7359       0
  184  4.1630949e+02  2.0755120e+01   1.25e+01    -0.3    7364       0
  185  4.1625702e+02  8.2797030e+00   7.62e+00    -0.3    7390       0
  186  4.1612423e+02  6.3964213e+00   6.88e+00     0.0    7393       0
  187  4.1609371e+02  2.1252471e+00   5.21e+00     0.0    7381       0
  188  4.1606146e+02  2.1190373e+00   5.20e+00     0.0    7375       0
  189  4.1535343e+02  3.5988961e+00   5.77e+00     0.0    7286       0
  190  4.1601276e+02  3.9323141e+01   1.98e+01    -0.3    7360       0
  191  4.1557843e+02  2.6335915e+01   1.47e+01    -0.3    7509       0
  192  4.1511966e+02  1.4274265e+01   9.93e+00     0.0    7474       0
  193  4.1497927e+02  2.6209394e+00   5.38e+00     0.0    7439       0
  194  4.1494516e+02  2.0882597e+00   5.17e+00     0.0    7418       0
  195  4.1484196e+02  2.0279842e+00   5.15e+00     0.0    7365       0
  196  4.1468617e+02  6.4993497e+00   6.89e+00     0.0    7326       0
  197  4.1464030e+02  4.0513149e+00   5.93e+00    -0.3    7338       0
  198  4.1459541e+02  6.7591627e+00   6.99e+00     0.0    7332       0
  199  4.1455715e+02  4.1967542e+00   5.99e+00     0.0    7330       0
  200  4.1452339e+02  2.7026675e+00   5.41e+00     0.0    7325       0

ERROR EXIT -- Too many iterations

Products with A     :     280        Total time   (secs) :    34.2
Products with A'    :     201        Project time (secs) :     2.8
Newton iterations   :       0        Mat-vec time (secs) :    27.8
Line search its     :     126        Subspace iterations :       0


================================================================================
PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
================================================================================
No. rows              :    12800      No. columns           :    73051
Initial tau           : 2.21e+05      Two-norm of b         : 4.31e+03
```

```
 Optimality tol        : 1.00e-04      Target one-norm of x  : 2.21e+05
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

  Iter      Objective   Relative Gap      gNorm   stepG    nnzX    nnzG
     0  4.3069533e+03  5.8967216e+00   2.48e+02     0.0       0       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          1           4     1.00000e+00     3.31274e+03     3.699
         2          1          13     1.00000e+00     1.34317e+03     1.188
         3          1          21     1.00000e+00     1.13391e+03     6.710
         4          1          28     1.00000e+00     9.84133e+02     4.493
         5          1          35     1.00000e+00     8.52552e+02     2.974
         6          1          45     1.00000e+00     7.71495e+02     2.144
         7          1          57     1.00000e+00     7.25650e+02     1.717
         8          1          70     1.00000e+00     6.89101e+02     1.419
         9          1          83     1.00000e+00     6.55627e+02     1.187
        10          1         100     1.00000e+00     6.27024e+02     1.018
        11          1         114     1.00000e+00     6.04412e+02     8.984
        12          1         128     1.00000e+00     5.85511e+02     8.008
        13          1         144     1.00000e+00     5.69523e+02     7.278
        14          1         164     1.00000e+00     5.54976e+02     6.664
        15          1         184     1.00000e+00     5.41608e+02     5.965
        16          1         201     1.00000e+00     5.29922e+02     5.492
        17          1         214     1.00000e+00     5.21336e+02     5.211
        18          1         234     1.00000e+00     5.12258e+02     4.976
        19          1         251     1.00000e+00     5.03956e+02     4.656
        20          1         273     1.00000e+00     4.96020e+02     4.307
        21          1         292     1.00000e+00     4.89007e+02     3.949
        22          1         307     1.00000e+00     4.82811e+02     3.697
        23          1         324     1.00000e+00     4.77465e+02     3.425
        24          1         346     1.00000e+00     4.72421e+02     3.193
        25          1         368     1.00000e+00     4.67896e+02     2.988
        26          1         389     1.00000e+00     4.63622e+02     2.788
        27          1         411     1.00000e+00     4.59811e+02     2.643
        28          1         437     1.00000e+00     4.56486e+02     2.529
        29          1         461     1.00000e+00     4.53216e+02     2.374
        30          1         480     1.00000e+00     4.50491e+02     2.236
        31          1         505     1.00000e+00     4.47562e+02     2.121
        32          1         526     1.00000e+00     4.44973e+02     2.077
        33          1         545     1.00000e+00     4.42848e+02     1.928
        34          1         566     1.00000e+00     4.40881e+02     1.774
        35          1         585     1.00000e+00     4.38912e+02     1.716
        36          1         607     1.00000e+00     4.37120e+02     1.716
        37          1         627     1.00000e+00     4.35580e+02     1.645
        38          1         649     1.00000e+00     4.33838e+02     1.562
        39          1         666     1.00000e+00     4.32400e+02     1.545
        40          1         685     1.00000e+00     4.30996e+02     1.517
        41          1         714     1.00000e+00     4.29718e+02     1.416
        42          1         734     1.00000e+00     4.28498e+02     1.317
        43          1         767     1.00000e+00     4.27298e+02     1.307
        44          1         788     1.00000e+00     4.26151e+02     1.297
        45          1         814     1.00000e+00     4.25088e+02     1.280
        46          1         837     1.00000e+00     4.23804e+02     1.330
        47          1         856     1.00000e+00     4.23039e+02     1.228
```

48	1	884	1.00000e+00	4.21957e+02	1.086
49	1	904	1.00000e+00	4.21148e+02	1.100
50	1	921	1.00000e+00	4.20343e+02	1.133
51	1	946	1.00000e+00	4.19530e+02	1.094
52	1	974	1.00000e+00	4.18877e+02	9.787
53	1	1000	1.00000e+00	4.18178e+02	9.119
54	1	1021	1.00000e+00	4.17539e+02	9.576
55	1	1046	1.00000e+00	4.16894e+02	1.036
56	1	1067	1.00000e+00	4.16328e+02	9.969
57	1	1086	1.00000e+00	4.15539e+02	9.632
58	1	1113	1.00000e+00	4.14956e+02	9.764
59	1	1136	1.00000e+00	4.14386e+02	9.325
60	1	1154	1.00000e+00	4.13783e+02	8.407
61	1	1177	1.00000e+00	4.13299e+02	8.136
62	1	1198	1.00000e+00	4.12830e+02	7.797
63	1	1222	1.00000e+00	4.12326e+02	8.066
64	1	1250	1.00000e+00	4.11930e+02	7.764
65	1	1278	1.00000e+00	4.11436e+02	7.232
66	1	1298	1.00000e+00	4.11072e+02	6.949
67	1	1318	1.00000e+00	4.10683e+02	7.115
68	1	1338	1.00000e+00	4.10332e+02	7.155
69	1	1366	1.00000e+00	4.09980e+02	6.701
70	1	1389	1.00000e+00	4.09660e+02	6.446
71	1	1408	1.00000e+00	4.09290e+02	6.869
72	1	1440	1.00000e+00	4.09009e+02	6.861
73	1	1463	1.00000e+00	4.08683e+02	6.479
74	1	1483	1.00000e+00	4.08398e+02	6.245
75	1	1507	1.00000e+00	4.08139e+02	6.127
76	1	1538	1.00000e+00	4.07830e+02	6.387
77	1	1570	1.00000e+00	4.07585e+02	6.223
78	1	1596	1.00000e+00	4.07331e+02	5.692
79	1	1622	1.00000e+00	4.07058e+02	5.746
80	1	1651	1.00000e+00	4.06845e+02	5.652
81	1	1680	1.00000e+00	4.06576e+02	5.772
82	1	1704	1.00000e+00	4.06380e+02	5.506
83	1	1728	1.00000e+00	4.06164e+02	5.179
84	1	1755	1.00000e+00	4.05928e+02	5.534
85	1	1775	1.00000e+00	4.05791e+02	5.165
86	1	1799	1.00000e+00	4.05522e+02	4.576
87	1	1820	1.00000e+00	4.05377e+02	4.588
88	1	1845	1.00000e+00	4.05200e+02	4.612
89	1	1870	1.00000e+00	4.05048e+02	4.705
90	1	1900	1.00000e+00	4.04876e+02	4.754
91	1	1925	1.00000e+00	4.04715e+02	4.635
92	1	1957	1.00000e+00	4.04546e+02	4.542
93	1	1983	1.00000e+00	4.04419e+02	4.391
94	1	2005	1.00000e+00	4.04273e+02	4.356
95	1	2028	1.00000e+00	4.04133e+02	4.644
96	1	2049	1.00000e+00	4.04029e+02	4.284
97	1	2071	1.00000e+00	4.03888e+02	3.811
98	1	2110	1.00000e+00	4.03768e+02	4.078
99	1	2135	1.00000e+00	4.03672e+02	4.018
100	1	2159	1.00000e+00	4.03545e+02	3.778
101	1	2172	1.00000e+00	4.03471e+02	3.763

102	1	2195	1.00000e+00	4.03389e+02	3.786
103	1	2219	1.00000e+00	4.03270e+02	3.701
104	1	2251	1.00000e+00	4.03155e+02	3.764
105	1	2278	1.00000e+00	4.03079e+02	3.723
106	1	2316	1.00000e+00	4.02958e+02	3.674
107	1	2333	1.00000e+00	4.02894e+02	3.554
108	1	2376	1.00000e+00	4.02812e+02	3.660
109	1	2417	1.00000e+00	4.02730e+02	3.770
110	1	2455	1.00000e+00	4.02646e+02	3.552
111	1	2464	1.00000e+00	4.02604e+02	3.047
112	1	2484	1.00000e+00	4.02556e+02	2.825
113	1	2516	1.00000e+00	4.02471e+02	2.980
114	1	2542	1.00000e+00	4.02397e+02	3.091
115	1	2572	1.00000e+00	4.02328e+02	2.812
116	1	2607	1.00000e+00	4.02236e+02	2.889
117	1	2631	1.00000e+00	4.02186e+02	2.712
118	1	2661	1.00000e+00	4.02073e+02	2.781
119	1	2694	1.00000e+00	4.02017e+02	2.962
120	1	2733	1.00000e+00	4.01937e+02	3.283
121	1	2767	1.00000e+00	4.01863e+02	3.240
122	1	2796	1.00000e+00	4.01799e+02	2.813
123	1	2824	1.00000e+00	4.01745e+02	2.641
124	1	2859	1.00000e+00	4.01693e+02	2.825
125	1	2879	1.00000e+00	4.01636e+02	2.941
126	1	2905	1.00000e+00	4.01584e+02	2.834
127	1	2941	1.00000e+00	4.01516e+02	2.900
128	1	2990	1.00000e+00	4.01470e+02	2.895
129	1	3025	1.00000e+00	4.01415e+02	2.827
130	1	3065	1.00000e+00	4.01365e+02	2.794
131	1	3094	1.00000e+00	4.01317e+02	2.675
132	1	3117	1.00000e+00	4.01275e+02	2.613
133	1	3160	1.00000e+00	4.01221e+02	3.073
134	1	3192	1.00000e+00	4.01172e+02	2.985
135	1	3232	1.00000e+00	4.01100e+02	2.651
136	1	3276	1.00000e+00	4.01060e+02	2.293
137	1	3311	1.00000e+00	4.01012e+02	2.312
138	1	3350	1.00000e+00	4.00967e+02	2.557
139	1	3363	1.00000e+00	4.00942e+02	2.412
140	1	3408	1.00000e+00	4.00882e+02	2.454
141	1	3443	1.00000e+00	4.00846e+02	2.486
142	1	3471	1.00000e+00	4.00809e+02	2.041
143	1	3486	1.00000e+00	4.00778e+02	1.881
144	1	3514	1.00000e+00	4.00757e+02	1.923
145	1	3551	1.00000e+00	4.00696e+02	2.480
146	1	3587	1.00000e+00	4.00668e+02	2.264
147	1	3615	1.00000e+00	4.00616e+02	1.895
148	1	3636	1.00000e+00	4.00594e+02	1.988
149	1	3659	1.00000e+00	4.00573e+02	1.978
150	1	3673	1.00000e+00	4.00548e+02	1.643
151	1	3700	1.00000e+00	4.00523e+02	1.784
152	1	3736	1.00000e+00	4.00501e+02	1.967
153	1	3775	1.00000e+00	4.00466e+02	2.044
154	1	3827	1.00000e+00	4.00432e+02	1.961
155	1	3859	1.00000e+00	4.00400e+02	1.848

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      156          1       3887     1.00000e+00     4.00375e+02     1.812
      157          1       3908     1.00000e+00     4.00357e+02     1.688
      158          1       3930     1.00000e+00     4.00336e+02     1.655
      159          1       3959     1.00000e+00     4.00319e+02     1.698
      160          1       3992     1.00000e+00     4.00300e+02     1.774
      161          1       4038     1.00000e+00     4.00281e+02     1.811
      162          1       4068     1.00000e+00     4.00261e+02     1.725
      163          1       4100     1.00000e+00     4.00244e+02     1.537
      164          1       4114     1.00000e+00     4.00234e+02     1.289
      165          1       4137     1.00000e+00     4.00225e+02     1.230
      166          1       4152     1.00000e+00     4.00215e+02     1.283
      167          1       4172     1.00000e+00     4.00204e+02     1.344
      168          1       4192     1.00000e+00     4.00192e+02     1.381
      169          1       4225     1.00000e+00     4.00181e+02     1.382
      170          1       4248     1.00000e+00     4.00171e+02     1.264
      171          1       4288     1.00000e+00     4.00159e+02     1.240
      172          1       4325     1.00000e+00     4.00150e+02     1.313
      173          1       4364     1.00000e+00     4.00138e+02     1.418
      174          1       4405     1.00000e+00     4.00128e+02     1.336
      175          1       4443     1.00000e+00     4.00115e+02     1.251
      176          1       4474     1.00000e+00     4.00106e+02     1.310
      177          1       4506     1.00000e+00     4.00097e+02     1.242
      178          1       4545     1.00000e+00     4.00085e+02     1.218
      179          1       4582     1.00000e+00     4.00076e+02     1.296
      180          1       4609     1.00000e+00     4.00068e+02     1.245
      181          1       4639     1.00000e+00     4.00059e+02     1.133
      182          1       4666     1.00000e+00     4.00051e+02     1.113
      183          1       4686     1.00000e+00     4.00045e+02     1.031
      184          1       4716     1.00000e+00     4.00037e+02     1.060
      185          1       4739     1.00000e+00     4.00031e+02     1.078
      186          1       4767     1.00000e+00     4.00023e+02     1.012
      187          1       4796     1.00000e+00     4.00015e+02     1.035
      188          1       4838     1.00000e+00     4.00008e+02     1.141
      189          1       4874     1.00000e+00     4.00002e+02     1.047
      190          1       4905     1.00000e+00     3.99993e+02     1.008
      191          1       4942     1.00000e+00     3.99988e+02     1.080
      192          1       4976     1.00000e+00     3.99981e+02     1.008
      193          1       4999     1.00000e+00     3.99976e+02     9.757
      194          1       5026     1.00000e+00     3.99972e+02     9.105
      195          1       5054     1.00000e+00     3.99966e+02     8.586
      196          1       5075     1.00000e+00     3.99960e+02     9.807
      197          1       5099     1.00000e+00     3.99956e+02     9.221
      198          1       5143     1.00000e+00     3.99949e+02     9.023
      199          1       5152     1.00000e+00     3.99947e+02     8.046
      200          1       5191     1.00000e+00     3.99940e+02     8.585
  200  3.9994030e+02  4.2055423e-01   4.32e+00     0.0    6914       0
ERROR EXIT -- Too many iterations

Products with A     :     202        Total time   (secs) :   601.4
Products with A'    :     202        Project time (secs) :   537.0
Newton iterations   :       0        Mat-vec time (secs) :    26.0


================================================================================
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SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
================================================================================
No. rows              :    12800      No. columns           :    73051
Initial tau           : 0.00e+00      Two-norm of b         : 4.31e+03
Optimality tol        : 1.00e-04      Target objective      : 0.00e+00
Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

 Iter      Objective   Relative Gap  Rel Error      gNorm   stepG    nnzX
    0  4.3069533e+03  0.0000000e+00  1.00e+00  2.478e+02     0.0       0
    1  4.2603310e+03  2.0324002e+00  1.00e+00  2.440e+02    -0.3       1
    2  3.8291062e+03  8.1903902e+00  1.00e+00  7.001e+02    -0.3     773
    3  3.6374906e+03  9.1937078e+00  1.00e+00  8.054e+02     0.0    2978
    4  2.7135072e+03  3.3235081e+00  1.00e+00  1.929e+02     0.0    4538
    5  2.5878558e+03  1.9224744e+00  1.00e+00  1.265e+02     0.0    4253
    6  2.5530594e+03  1.4377578e+00  1.00e+00  1.041e+02     0.0    3627
    7  2.5241878e+03  2.0563001e+00  1.00e+00  1.302e+02     0.0    3111
    8  2.5098193e+03  3.2606891e+00  1.00e+00  1.798e+02     0.0    2693
    9  2.5084986e+03  4.6399228e+00  1.00e+00  2.377e+02     0.0    2547
   10  2.4847277e+03  1.0474311e+00  1.00e+00  8.699e+01     0.0    2510
   11  2.4803270e+03  4.0134600e-01  1.00e+00  6.045e+01     0.0    2445
   12  2.4744343e+03  3.8835101e-01  1.00e+00  5.996e+01     0.0    2335
   13  2.4505232e+03  1.3376656e+00  1.00e+00  9.804e+01     0.0    1662
   14  2.4696470e+03  3.6754471e+00  1.00e+00  1.908e+02    -0.3    1651
   15  2.4446393e+03  1.0882286e+00  1.00e+00  8.726e+01    -0.3    1865
   16  2.4374848e+03  8.1982945e-01  1.00e+00  7.657e+01     0.0    1869
   17  2.4353823e+03  2.8549102e-01  1.00e+00  5.551e+01     0.0    1785
   18  2.4334263e+03  3.1481769e-01  1.00e+00  5.678e+01     0.0    1725
   19  2.4307705e+03  6.6378529e-01  1.00e+00  7.061e+01     0.0    1610
   20  2.4346711e+03  2.6771299e+00  1.00e+00  1.498e+02     0.0    1564
   21  2.4294986e+03  7.2738457e-01  1.00e+00  7.291e+01    -0.3    1574
   22  2.4271947e+03  3.2985517e-01  1.00e+00  5.728e+01     0.0    1597
   23  2.4266561e+03  1.8723414e-01  1.00e+00  5.170e+01     0.0    1572
   24  2.4254627e+03  1.4141214e-01  1.00e+00  4.994e+01     0.0    1545
   25  2.4224585e+03  1.7097773e-01  1.00e+00  5.098e+01     0.0    1481
   26  2.4212384e+03  9.6990645e-01  1.00e+00  8.229e+01    -0.3    1487
   27  2.4208172e+03  7.8150867e-01  1.00e+00  7.480e+01    -0.3    1472
   28  2.4199362e+03  5.9472144e-01  1.00e+00  6.754e+01     0.0    1470
   29  2.4192170e+03  4.4537742e-01  1.00e+00  6.172e+01     0.0    1469
   30  2.4189530e+03  1.4007073e-01  1.00e+00  4.979e+01     0.0    1460
   31  2.4186848e+03  1.4038172e-01  1.00e+00  4.980e+01     0.0    1450
   32  2.4154724e+03  5.2978443e-01  1.00e+00  6.408e+01     0.0    1206
   33  2.4130310e+03  4.2322900e-01  1.00e+00  6.043e+01    -0.3    1265
   34  2.4128289e+03  1.1541109e+00  1.00e+00  8.882e+01     0.0    1329
   35  2.4124490e+03  6.6858146e-01  1.00e+00  7.001e+01     0.0    1333
   36  2.4109720e+03  6.2143628e-01  1.00e+00  6.822e+01     0.0    1364
   37  2.4106848e+03  1.3953518e-01  1.00e+00  4.952e+01     0.0    1341
   38  2.4106097e+03  1.3883242e-01  1.00e+00  4.949e+01     0.0    1326
   39  1.7808000e+03  2.2677338e+01  1.00e+00  1.669e+02     0.0    3470
   40  2.0376617e+03  4.2017703e+01  1.00e+00  4.628e+02     0.0   13437
   41  1.3879902e+03  8.2244576e+01  1.00e+00  4.123e+02     0.0   17143
   42  9.5127471e+02  3.8799936e+01  1.00e+00  9.979e+01     0.0   23707
   43  9.0161048e+02  4.4999194e+00  1.00e+00  1.766e+01     0.0   19988
   44  8.6842720e+02  4.0528597e+00  1.00e+00  1.616e+01     0.0   16640
   45  8.1367653e+02  2.1372121e+01  1.00e+00  4.624e+01     0.0   10581
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46	8.4202362e+02	7.5792119e+01	1.00e+00	1.471e+02	-0.3	10519
47	8.2024885e+02	8.0114043e+01	1.00e+00	1.484e+02	0.0	11204
48	7.8382239e+02	1.2764262e+01	1.00e+00	2.885e+01	0.0	10596
49	7.8139593e+02	2.2354435e+00	1.00e+00	1.202e+01	0.0	10238
50	7.7883647e+02	2.1952649e+00	1.00e+00	1.195e+01	0.0	9829
51	7.6310766e+02	1.8901125e+01	1.00e+00	3.735e+01	0.0	7784
52	7.6508001e+02	4.8955561e+01	1.00e+00	8.291e+01	-0.3	8143
53	7.6457414e+02	5.5606307e+01	1.00e+00	9.297e+01	0.0	8215
54	7.5438080e+02	3.1862033e+00	1.00e+00	1.321e+01	0.0	8156
55	7.5382457e+02	2.2377626e+00	1.00e+00	1.179e+01	0.0	8053
56	7.5212489e+02	2.7734533e+00	1.00e+00	1.255e+01	0.0	7850
57	7.4840120e+02	3.1073729e+01	1.00e+00	5.362e+01	0.0	7189
58	7.5369486e+02	4.7459911e+01	1.00e+00	7.851e+01	-0.3	7329
59	7.4437382e+02	5.0256422e+00	1.00e+00	1.565e+01	0.0	7455
60	7.4396411e+02	1.4439200e+00	1.00e+00	1.049e+01	0.0	7342
61	7.4338660e+02	1.4513603e+00	1.00e+00	1.049e+01	0.0	7252
62	7.4017587e+02	3.4429956e+01	1.00e+00	5.741e+01	0.0	6672
63	7.3815139e+02	7.8481357e+00	1.00e+00	1.950e+01	-0.3	6863
64	7.3696669e+02	5.2170419e+00	1.00e+00	1.575e+01	0.0	6915
65	7.3656742e+02	1.3553101e+00	1.00e+00	1.029e+01	0.0	6860
66	7.3586110e+02	2.7379478e+00	1.00e+00	1.224e+01	0.0	6787
67	7.3479807e+02	1.5797500e+00	1.00e+00	1.057e+01	0.0	6669
68	7.3591483e+02	3.0663524e+01	1.00e+00	5.156e+01	-0.3	6630
69	7.3407850e+02	5.7381676e+00	1.00e+00	1.641e+01	-0.3	6715
70	7.3365770e+02	3.5155975e+00	1.00e+00	1.329e+01	0.0	6668
71	7.3348794e+02	1.3460413e+00	1.00e+00	1.025e+01	0.0	6629
72	7.3265983e+02	2.1959169e+00	1.00e+00	1.141e+01	0.0	6543
73	7.3328131e+02	2.1499372e+01	1.00e+00	3.842e+01	-0.3	6429
74	7.3163779e+02	2.1400607e+00	1.00e+00	1.134e+01	-0.3	6546
75	7.3133746e+02	2.3576043e+00	1.00e+00	1.164e+01	0.0	6530
76	7.3100992e+02	1.2816179e+00	1.00e+00	1.013e+01	0.0	6479
77	7.3027870e+02	3.5252797e+00	1.00e+00	1.322e+01	0.0	6376
78	7.3100915e+02	1.7374894e+01	1.00e+00	3.249e+01	-0.3	6311
79	7.2973969e+02	1.9046715e+00	1.00e+00	1.099e+01	-0.3	6415
80	7.2944627e+02	1.4736922e+00	1.00e+00	1.039e+01	0.0	6391
81	7.2907645e+02	1.1002416e+00	1.00e+00	9.860e+00	0.0	6327
82	7.2864692e+02	1.5872636e+00	1.00e+00	1.052e+01	0.0	6264
83	7.2876556e+02	2.0263268e+01	1.00e+00	3.633e+01	-0.3	6206
84	7.2793648e+02	3.1763934e+00	1.00e+00	1.271e+01	-0.3	6269
85	7.2780542e+02	2.3141353e+00	1.00e+00	1.152e+01	0.0	6243
86	7.2762803e+02	9.1646137e-01	1.00e+00	9.592e+00	0.0	6207
87	7.2692111e+02	9.1565140e-01	1.00e+00	9.579e+00	0.0	6135
88	7.2635428e+02	8.2937471e+00	1.00e+00	1.972e+01	-0.3	6145
89	7.2645079e+02	5.7464576e+00	1.00e+00	1.620e+01	-0.3	6226
90	7.2578333e+02	5.3165226e+00	1.00e+00	1.561e+01	0.0	6204
91	7.2561437e+02	8.0988675e-01	1.00e+00	9.435e+00	0.0	6172
92	7.2554756e+02	1.0734314e+00	1.00e+00	9.794e+00	0.0	6134
93	7.2493532e+02	6.2858153e+00	1.00e+00	1.687e+01	0.0	5956
94	7.2450687e+02	4.6273154e+00	1.00e+00	1.463e+01	-0.3	6067
95	7.2414281e+02	2.9324637e+00	1.00e+00	1.231e+01	0.0	6045
96	7.2394599e+02	6.5163681e-01	1.00e+00	9.199e+00	0.0	6036
97	7.2384228e+02	6.3191241e-01	1.00e+00	9.173e+00	0.0	6019
98	7.2362046e+02	6.2252115e-01	1.00e+00	9.157e+00	0.0	5989
99	7.2126719e+02	8.7948869e+00	1.00e+00	2.019e+01	0.0	5723

100	7.2216575e+02	1.3759909e+01	1.00e+00	2.690e+01	-0.3	5898
101	7.2079871e+02	1.1955722e+01	1.00e+00	2.444e+01	0.0	5974
102	7.2015565e+02	1.9478649e+00	1.00e+00	1.092e+01	0.0	5931
103	7.2007816e+02	2.1420408e+00	1.00e+00	1.118e+01	0.0	5910
104	7.1994957e+02	9.1206180e-01	1.00e+00	9.521e+00	0.0	5869
105	7.1976508e+02	1.4627268e+00	1.00e+00	1.026e+01	0.0	5825
106	7.1977764e+02	9.6955184e+00	1.00e+00	2.135e+01	-0.3	5815
107	4.9124157e+02	8.1789793e+01	1.00e+00	4.944e+01	0.0	15525
108	4.8629212e+02	1.6171295e+02	1.00e+00	9.286e+01	0.0	15399
109	4.7387045e+02	8.8031450e+01	1.00e+00	5.017e+01	0.0	14427
110	4.6726815e+02	6.3192136e+00	1.00e+00	7.734e+00	0.0	13767
111	4.6632275e+02	3.3848833e+00	1.00e+00	6.257e+00	0.0	13271
112	4.6171810e+02	6.6622029e+00	1.00e+00	7.936e+00	0.0	10806
113	4.6273155e+02	4.0442993e+01	1.00e+00	2.460e+01	0.0	9389
114	4.6002114e+02	1.3834033e+01	1.00e+00	1.139e+01	-0.3	9918
115	4.5883668e+02	4.3404873e+00	1.00e+00	6.740e+00	0.0	9703
116	4.5827944e+02	3.1890392e+00	1.00e+00	6.185e+00	0.0	9462
117	4.5775221e+02	4.1730546e+00	1.00e+00	6.670e+00	0.0	9164
118	4.5731669e+02	2.1003889e+01	1.00e+00	1.481e+01	0.0	8824
119	4.5824114e+02	3.7117165e+01	1.00e+00	2.266e+01	-0.3	8763
120	4.5687306e+02	1.2983400e+01	1.00e+00	1.092e+01	0.0	8780
121	4.5670097e+02	1.6190998e+00	1.00e+00	5.447e+00	0.0	8727
122	4.5661469e+02	2.5342785e+00	1.00e+00	5.888e+00	0.0	8687
123	4.5581158e+02	3.1979182e+01	1.00e+00	2.004e+01	0.0	7937
124	4.5669859e+02	4.5628211e+01	1.00e+00	2.670e+01	-0.3	8037
125	4.5490208e+02	6.2327823e+00	1.00e+00	7.688e+00	0.0	8075
126	4.5475155e+02	1.8534092e+00	1.00e+00	5.596e+00	0.0	8034
127	4.5454716e+02	2.1461875e+00	1.00e+00	5.734e+00	0.0	7983
128	4.5437017e+02	2.5805065e+01	1.00e+00	1.701e+01	-0.3	7869
129	4.5413974e+02	1.6237728e+00	1.00e+00	5.480e+00	-0.3	7909
130	4.5408508e+02	3.9254463e+00	1.00e+00	6.576e+00	0.0	7884
131	4.5400529e+02	1.3678535e+00	1.00e+00	5.357e+00	0.0	7859
132	4.5355575e+02	1.0251085e+00	1.00e+00	5.193e+00	0.0	7698
133	4.5337874e+02	1.7155494e+01	1.00e+00	1.286e+01	-0.3	7705
134	4.5324898e+02	2.2274310e+00	1.00e+00	5.768e+00	-0.3	7769
135	4.5318270e+02	4.7750700e+00	1.00e+00	6.977e+00	0.0	7736
136	4.5313419e+02	1.0928517e+00	1.00e+00	5.230e+00	0.0	7699
137	4.5300672e+02	2.2121349e+00	1.00e+00	5.760e+00	0.0	7627
138	4.5289717e+02	1.8733463e+01	1.00e+00	1.358e+01	0.0	7445
139	4.5287943e+02	1.9058805e+01	1.00e+00	1.374e+01	-0.3	7521
140	3.3557508e+02	1.1986562e+01	1.00e+00	5.844e+00	0.0	42212
141	3.1832326e+02	2.1535708e+01	1.00e+00	7.604e+00	0.0	25089
142	3.1163434e+02	4.5533596e+01	1.00e+00	1.240e+01	0.0	17635
143	3.1577330e+02	2.3191018e+02	1.00e+00	5.282e+01	0.0	14072
144	3.1408658e+02	1.9598949e+02	1.00e+00	4.462e+01	0.0	13970
145	3.0705526e+02	9.8121145e+00	1.00e+00	4.860e+00	0.0	13680
146	3.0677184e+02	3.5141437e+00	1.00e+00	3.577e+00	0.0	13336
147	3.0575744e+02	7.5953114e+00	1.00e+00	4.402e+00	0.0	12279
148	3.0589250e+02	9.1669164e+01	1.00e+00	2.143e+01	0.0	10124
149	3.0440245e+02	1.3089418e+01	1.00e+00	5.541e+00	-0.3	10492
150	3.0368239e+02	5.5585063e+00	1.00e+00	4.023e+00	0.0	10441
151	3.0345052e+02	2.5755052e+00	1.00e+00	3.427e+00	0.0	10302
152	3.0307063e+02	9.9474345e+00	1.00e+00	4.883e+00	0.0	10056
153	3.0312239e+02	5.2600022e+01	1.00e+00	1.334e+01	0.0	9800

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  154  3.0272479e+02  2.9798453e+00   1.00e+00  3.494e+00    -0.3    9864
  155  3.0260452e+02  3.5831314e+00   1.00e+00  3.613e+00     0.0    9825
  156  3.0243098e+02  8.0059725e+00   1.00e+00  4.491e+00     0.0    9701
  157  3.0229549e+02  2.1265336e+01   1.00e+00  7.100e+00     0.0    9557
  158  3.0214291e+02  2.9007114e+00   1.00e+00  3.480e+00    -0.3    9610
  159  3.0204590e+02  5.3527056e+00   1.00e+00  3.964e+00     0.0    9561
  160  3.0197480e+02  3.5924038e+00   1.00e+00  3.618e+00     0.0    9537
  161  3.0185554e+02  9.5605828e+00   1.00e+00  4.793e+00     0.0    9464
  162  3.0183116e+02  2.6433589e+01   1.00e+00  8.115e+00    -0.3    9385
  163  3.0180759e+02  3.0258570e+01   1.00e+00  8.868e+00    -0.3    9381
  164  3.0160326e+02  8.2822075e+00   1.00e+00  4.542e+00     0.0    9362
  165  3.0157299e+02  2.8683490e+00   1.00e+00  3.478e+00     0.0    9347
  166  3.0150324e+02  4.0528582e+00   1.00e+00  3.711e+00     0.0    9319
  167  3.0124377e+02  3.3061437e+01   1.00e+00  9.401e+00     0.0    9088
  168  3.0108900e+02  5.1669023e+00   1.00e+00  3.936e+00    -0.3    9136
  169  3.0094332e+02  5.5035039e+00   1.00e+00  4.000e+00     0.0    9117
  170  3.0090095e+02  2.1410292e+00   1.00e+00  3.342e+00     0.0    9092
  171  3.0076929e+02  1.3669452e+01   1.00e+00  5.596e+00     0.0    9032
  172  3.0072752e+02  4.9004858e+00   1.00e+00  3.881e+00    -0.3    9047
  173  3.0068322e+02  8.2770843e+00   1.00e+00  4.541e+00     0.0    9029
  174  3.0064298e+02  3.2556342e+00   1.00e+00  3.560e+00     0.0    9004
  175  3.0058094e+02  7.5379833e+00   1.00e+00  4.397e+00     0.0    8981
  176  3.0059218e+02  2.4231024e+01   1.00e+00  7.654e+00     0.0    8938
  177  2.0645933e+02  2.6872254e+02   1.00e+00  2.488e+01     0.0   19604
  178  2.1120144e+02  5.4983790e+02   1.00e+00  5.202e+01     0.0   19721
  179  1.9755228e+02  2.3652793e+02   1.00e+00  2.059e+01     0.0   18985
  180  1.9468754e+02  9.0915291e+00   1.00e+00  2.327e+00     0.0   18169
  181  1.9426395e+02  8.2181271e+00   1.00e+00  2.261e+00     0.0   17511
  182  1.9201161e+02  4.7057812e+01   1.00e+00  5.286e+00     0.0   13875
  183  1.9254442e+02  1.9999396e+02   1.00e+00  1.691e+01    -0.3   13243
  184  1.9135238e+02  9.7758695e+01   1.00e+00  9.037e+00    -0.3   13529
  185  1.9085554e+02  1.2118678e+01   1.00e+00  2.588e+00     0.0   13303
  186  1.9075550e+02  5.0305447e+00   1.00e+00  2.058e+00     0.0   13145
  187  1.9047757e+02  1.0813305e+01   1.00e+00  2.493e+00     0.0   12769
  188  1.8991707e+02  5.2197697e+01   1.00e+00  5.570e+00     0.0   11908
  189  1.8991575e+02  7.0917903e+01   1.00e+00  6.958e+00    -0.3   12034
  190  1.5117877e+02  4.1157533e+01   1.00e+00  3.071e+00     0.0   39145
  191  1.4691886e+02  8.0733431e+01   1.00e+00  4.701e+00     0.0   24071
  192  1.4594419e+02  1.8618317e+02   1.00e+00  9.175e+00     0.0   18424
  193  1.4699815e+02  3.7431248e+02   1.00e+00  1.748e+01     0.0   16796
  194  1.4474366e+02  6.2470870e+01   1.00e+00  3.838e+00     0.0   16512
  195  1.4456358e+02  8.4439648e+00   1.00e+00  1.560e+00     0.0   16120
  196  1.4438797e+02  8.2828129e+00   1.00e+00  1.555e+00     0.0   15609
  197  1.4348911e+02  8.5510141e+01   1.00e+00  4.837e+00     0.0   12522
  198  1.4322188e+02  1.3462471e+02   1.00e+00  6.830e+00    -0.3   12865
  199  1.4306326e+02  1.8051907e+02   1.00e+00  8.701e+00     0.0   12841
  200  1.4258649e+02  8.2057524e+00   1.00e+00  1.598e+00     0.0   12787

ERROR EXIT -- Too many iterations

Products with A     :     271        Total time   (secs) :    27.9
Products with A'    :     201        Project time (secs) :     2.3
Newton iterations   :       6        Mat-vec time (secs) :    23.3
Line search its     :     100        Subspace iterations :       0
```

```
================================================================================
PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
================================================================================
No. rows              :    12800      No. columns           :    73051
Initial tau           : 0.00e+00      Two-norm of b         : 4.31e+03
Optimality tol        : 1.00e-04      Target objective      : 0.00e+00
Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

    0  4.3069533e+03  0.0000000e+00   1.00e+00  2.478e+02     0.0       0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          1           4     1.00000e+00     2.87540e+03     7.084
         2          1          11     1.00000e+00     2.67286e+03     3.411
         3          1          19     1.00000e+00     2.60480e+03     1.945
         4          1          27     1.00000e+00     2.56743e+03     1.492
         5          1          34     1.00000e+00     2.53165e+03     1.130
         6          1          43     1.00000e+00     2.50327e+03     8.401
         7          1          53     1.00000e+00     2.48446e+03     6.599
         8          1          63     1.00000e+00     2.47104e+03     5.544
         9          1          73     1.00000e+00     2.45969e+03     4.714
        10          1          88     1.00000e+00     2.45174e+03     4.128
        11          1         103     1.00000e+00     2.44502e+03     3.564
        12          1         115     1.00000e+00     2.43870e+03     3.063
        13          1         133     1.00000e+00     2.43421e+03     2.676
        14          1         149     1.00000e+00     2.43044e+03     2.288
        15          1         160     1.00000e+00     2.42744e+03     1.982
        16          1         176     1.00000e+00     2.42518e+03     1.744
        17          1         187     1.00000e+00     2.42297e+03     1.624
        18          1         205     1.00000e+00     2.42085e+03     1.667
        19          1         218     1.00000e+00     2.41944e+03     1.603
        20          1         236     1.00000e+00     2.41769e+03     1.505
        21          1         252     1.00000e+00     2.41649e+03     1.375
break of testUpdateTau    21  2.4164922e+03  1.7548442e-01   1.00e+00  5.0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        22          1           4     1.00000e+00     1.25094e+03     1.114
        23          1          11     1.00000e+00     1.00443e+03     4.359
        24          1          19     1.00000e+00     9.45337e+02     2.629
        25          1          27     1.00000e+00     9.01917e+02     1.863
        26          1          37     1.00000e+00     8.71239e+02     1.388
        27          1          46     1.00000e+00     8.48020e+02     1.049
        28          1          56     1.00000e+00     8.31908e+02     8.214
        29          1          66     1.00000e+00     8.19933e+02     6.738
        30          1          76     1.00000e+00     8.09984e+02     5.786
        31          1          89     1.00000e+00     8.02413e+02     5.360
        32          1         104     1.00000e+00     7.96084e+02     4.909
        33          1         118     1.00000e+00     7.90145e+02     4.200
        34          1         133     1.00000e+00     7.85514e+02     3.556
        35          1         145     1.00000e+00     7.81430e+02     3.150
        36          1         163     1.00000e+00     7.78382e+02     2.923
```

```
          37          1        178     1.00000e+00     7.75316e+02     2.784
          38          1        194     1.00000e+00     7.72955e+02     2.585
          39          1        212     1.00000e+00     7.70621e+02     2.305
          40          1        225     1.00000e+00     7.69029e+02     2.158
          41          1        244     1.00000e+00     7.67368e+02     2.195
          42          1        257     1.00000e+00     7.65936e+02     2.177
          43          1        273     1.00000e+00     7.64430e+02     2.020
          44          1        291     1.00000e+00     7.63117e+02     1.756
          45          1        313     1.00000e+00     7.61817e+02     1.651
          46          1        332     1.00000e+00     7.60875e+02     1.656
          47          1        348     1.00000e+00     7.59873e+02     1.626
          48          1        364     1.00000e+00     7.58913e+02     1.512
          49          1        379     1.00000e+00     7.57898e+02     1.438
          50          1        399     1.00000e+00     7.57065e+02     1.457
          51          1        418     1.00000e+00     7.56289e+02     1.416
          52          1        441     1.00000e+00     7.55490e+02     1.382
          53          1        464     1.00000e+00     7.54760e+02     1.355
          54          1        482     1.00000e+00     7.54104e+02     1.232
          55          1        502     1.00000e+00     7.53446e+02     1.114
          56          1        519     1.00000e+00     7.52907e+02     1.145
          57          1        539     1.00000e+00     7.52436e+02     1.132
          58          1        564     1.00000e+00     7.51910e+02     1.037
          59          1        590     1.00000e+00     7.51453e+02     9.755
          60          1        613     1.00000e+00     7.51061e+02     9.650
          61          1        631     1.00000e+00     7.50686e+02     9.585
break of testUpdateTau    61  7.5068633e+02  8.1385666e-01   1.00e+00  9.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
          62          1          4     1.00000e+00     3.73550e+02     5.741
          63          1         10     1.00000e+00     2.76338e+02     2.195
          64          1         18     1.00000e+00     2.50569e+02     1.322
          65          1         27     1.00000e+00     2.28387e+02     8.331
          66          1         36     1.00000e+00     2.15882e+02     6.115
          67          1         48     1.00000e+00     2.07731e+02     4.811
          68          1         59     1.00000e+00     2.02459e+02     4.004
          69          1         72     1.00000e+00     1.97342e+02     3.269
          70          1         87     1.00000e+00     1.92752e+02     2.748
          71          1        104     1.00000e+00     1.89121e+02     2.438
          72          1        122     1.00000e+00     1.86073e+02     2.195
          73          1        138     1.00000e+00     1.83413e+02     1.960
          74          1        155     1.00000e+00     1.81075e+02     1.742
          75          1        172     1.00000e+00     1.79187e+02     1.575
          76          1        191     1.00000e+00     1.77366e+02     1.474
          77          1        210     1.00000e+00     1.75836e+02     1.381
          78          1        228     1.00000e+00     1.74386e+02     1.264
          79          1        248     1.00000e+00     1.73044e+02     1.184
          80          1        270     1.00000e+00     1.71884e+02     1.108
          81          1        287     1.00000e+00     1.70724e+02     1.075
          82          1        305     1.00000e+00     1.69752e+02     1.018
          83          1        321     1.00000e+00     1.68799e+02     9.538
          84          1        336     1.00000e+00     1.67941e+02     9.295
          85          1        357     1.00000e+00     1.67173e+02     9.085
          86          1        378     1.00000e+00     1.66492e+02     8.415
```

87	1	399	1.00000e+00	1.65821e+02	7.780
88	1	418	1.00000e+00	1.65215e+02	7.703
89	1	433	1.00000e+00	1.64651e+02	7.733
90	1	448	1.00000e+00	1.64080e+02	7.488
91	1	467	1.00000e+00	1.63557e+02	7.082
92	1	482	1.00000e+00	1.63088e+02	6.731
93	1	502	1.00000e+00	1.62652e+02	6.502
94	1	525	1.00000e+00	1.62228e+02	6.336
95	1	549	1.00000e+00	1.61811e+02	6.279
96	1	566	1.00000e+00	1.61412e+02	6.154
97	1	591	1.00000e+00	1.61035e+02	5.802
98	1	611	1.00000e+00	1.60633e+02	5.659
99	1	630	1.00000e+00	1.60295e+02	5.678
100	1	650	1.00000e+00	1.59972e+02	5.517
101	1	669	1.00000e+00	1.59637e+02	5.320
102	1	686	1.00000e+00	1.59372e+02	5.099
103	1	710	1.00000e+00	1.59084e+02	4.952
104	1	719	1.00000e+00	1.58966e+02	4.932
105	1	737	1.00000e+00	1.58752e+02	4.735
106	1	761	1.00000e+00	1.58457e+02	4.459
107	1	780	1.00000e+00	1.58221e+02	4.430
108	1	803	1.00000e+00	1.58010e+02	4.507
109	1	823	1.00000e+00	1.57781e+02	4.464
110	1	845	1.00000e+00	1.57516e+02	4.414
111	1	871	1.00000e+00	1.57300e+02	4.125
112	1	895	1.00000e+00	1.57070e+02	3.957
113	1	921	1.00000e+00	1.56869e+02	4.061
114	1	950	1.00000e+00	1.56698e+02	3.992
115	1	968	1.00000e+00	1.56509e+02	3.632
116	1	993	1.00000e+00	1.56310e+02	3.524
117	1	1018	1.00000e+00	1.56150e+02	3.650
118	1	1053	1.00000e+00	1.55977e+02	3.768
119	1	1072	1.00000e+00	1.55806e+02	3.692
120	1	1090	1.00000e+00	1.55642e+02	3.242
121	1	1116	1.00000e+00	1.55463e+02	3.257
122	1	1142	1.00000e+00	1.55333e+02	3.385
123	1	1170	1.00000e+00	1.55191e+02	3.320
124	1	1189	1.00000e+00	1.55046e+02	3.127
125	1	1216	1.00000e+00	1.54880e+02	3.317
126	1	1243	1.00000e+00	1.54772e+02	3.249
127	1	1269	1.00000e+00	1.54621e+02	3.136
128	1	1287	1.00000e+00	1.54520e+02	2.783
129	1	1310	1.00000e+00	1.54386e+02	2.839
130	1	1332	1.00000e+00	1.54298e+02	2.856
131	1	1350	1.00000e+00	1.54177e+02	2.663
132	1	1380	1.00000e+00	1.54060e+02	2.679
133	1	1400	1.00000e+00	1.53936e+02	2.881
134	1	1433	1.00000e+00	1.53830e+02	2.937
135	1	1475	1.00000e+00	1.53710e+02	2.928
136	1	1504	1.00000e+00	1.53593e+02	2.885
137	1	1526	1.00000e+00	1.53469e+02	2.638
138	1	1560	1.00000e+00	1.53333e+02	2.716
139	1	1594	1.00000e+00	1.53242e+02	2.785
140	1	1622	1.00000e+00	1.53135e+02	2.744

```
          141          1       1650     1.00000e+00     1.53042e+02     2.424
          142          1       1681     1.00000e+00     1.52942e+02     2.364
          143          1       1710     1.00000e+00     1.52852e+02     2.577
          144          1       1746     1.00000e+00     1.52755e+02     2.733
          145          1       1780     1.00000e+00     1.52655e+02     2.765
          146          1       1809     1.00000e+00     1.52565e+02     2.578
          147          1       1846     1.00000e+00     1.52469e+02     2.508
          148          1       1865     1.00000e+00     1.52407e+02     2.420
break of testUpdateTau   148  1.5240739e+02  4.3190772e+00   1.00e+00  1.6

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
          149          1          4     1.00000e+00     7.81144e+01     1.524
          150          1         10     1.00000e+00     5.49772e+01     5.833
          151          1         18     1.00000e+00     4.86894e+01     3.410
          152          1         27     1.00000e+00     4.32649e+01     1.997
          153          1         35     1.00000e+00     4.04149e+01     1.474
          154          1         46     1.00000e+00     3.85811e+01     1.159
          155          1         57     1.00000e+00     3.72907e+01     9.521
          156          1         66     1.00000e+00     3.60295e+01     7.923
          157          1         80     1.00000e+00     3.49856e+01     6.843
          158          1         94     1.00000e+00     3.42051e+01     6.030
          159          1        110     1.00000e+00     3.35546e+01     5.392
          160          1        128     1.00000e+00     3.29234e+01     4.848
          161          1        145     1.00000e+00     3.23440e+01     4.384
          162          1        161     1.00000e+00     3.18465e+01     3.974
          163          1        182     1.00000e+00     3.13706e+01     3.632
          164          1        201     1.00000e+00     3.09525e+01     3.345
          165          1        219     1.00000e+00     3.05751e+01     3.045
          166          1        238     1.00000e+00     3.02286e+01     2.831
          167          1        254     1.00000e+00     2.99467e+01     2.696
          168          1        273     1.00000e+00     2.96634e+01     2.620
          169          1        293     1.00000e+00     2.94049e+01     2.509
          170          1        307     1.00000e+00     2.91721e+01     2.336
          171          1        331     1.00000e+00     2.89400e+01     2.168
          172          1        349     1.00000e+00     2.87216e+01     2.065
          173          1        367     1.00000e+00     2.85327e+01     1.997
          174          1        391     1.00000e+00     2.83644e+01     1.903
          175          1        413     1.00000e+00     2.81939e+01     1.812
          176          1        443     1.00000e+00     2.80282e+01     1.797
          177          1        457     1.00000e+00     2.78965e+01     1.701
          178          1        485     1.00000e+00     2.77687e+01     1.606
          179          1        509     1.00000e+00     2.76375e+01     1.581
          180          1        532     1.00000e+00     2.75266e+01     1.524
          181          1        563     1.00000e+00     2.74092e+01     1.471
          182          1        584     1.00000e+00     2.72850e+01     1.519
          183          1        600     1.00000e+00     2.71883e+01     1.484
          184          1        623     1.00000e+00     2.70667e+01     1.442
          185          1        649     1.00000e+00     2.69719e+01     1.382
          186          1        683     1.00000e+00     2.68740e+01     1.317
          187          1        718     1.00000e+00     2.67796e+01     1.310
          188          1        747     1.00000e+00     2.67003e+01     1.359
          189          1        773     1.00000e+00     2.66252e+01     1.316
          190          1        799     1.00000e+00     2.65396e+01     1.215
```

```
      191          1        832     1.00000e+00     2.64675e+01     1.161
      192          1        852     1.00000e+00     2.63970e+01     1.160
      193          1        872     1.00000e+00     2.63258e+01     1.148
      194          1        892     1.00000e+00     2.62467e+01     1.167
      195          1        919     1.00000e+00     2.61848e+01     1.126
      196          1        958     1.00000e+00     2.61141e+01     1.087
      197          1        983     1.00000e+00     2.60531e+01     1.097
      198          1       1004     1.00000e+00     2.59928e+01     1.073
      199          1       1026     1.00000e+00     2.59335e+01     9.890
      200          1       1048     1.00000e+00     2.58787e+01     9.369
  200  2.5878717e+01  2.7451212e+01   1.00e+00  2.514e-01     0.0   13545

 ERROR EXIT -- Too many iterations

 Products with A     :     205        Total time   (secs) :   437.0
 Products with A'    :     205        Project time (secs) :   367.7
 Newton iterations   :       5        Mat-vec time (secs) :    26.4


info_spg =

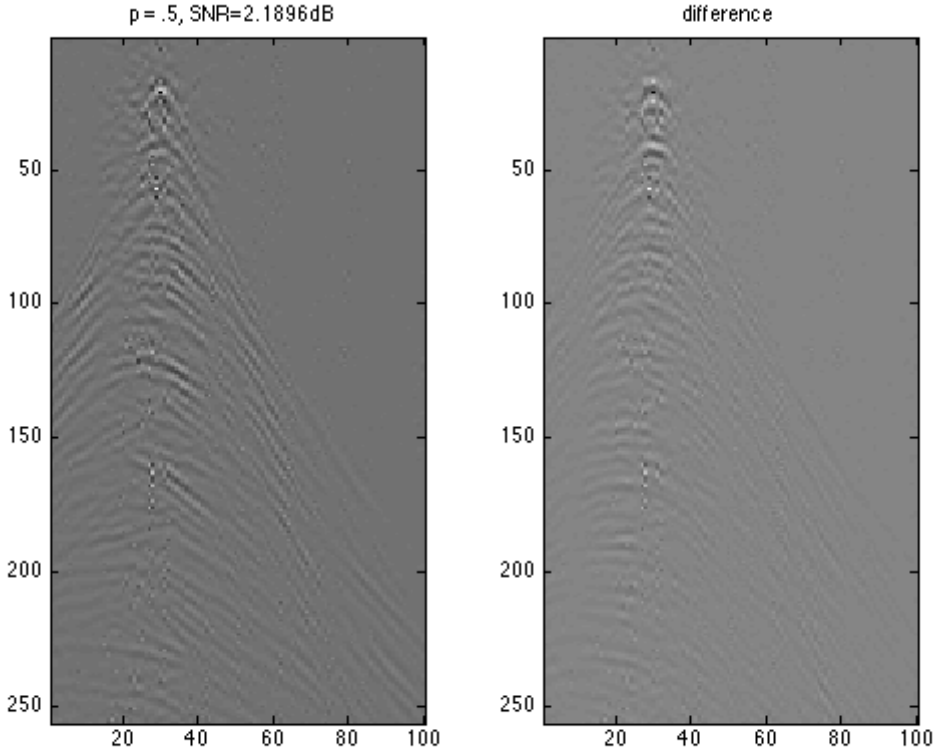
           tau: 2.4844e+05
          rNorm: 142.5865
           rGap: 8.2058
          gNorm: 1.5983
           stat: 5
           iter: 200
         nProdA: 271
        nProdAt: 201
        nNewton: 6
    timeProject: 2.3016
    timeMatProd: 23.3248
        itnLSQR: 0
        options: [1x1 struct]
      timeTotal: 27.8991
         xNorm1: [200x1 double]
         rNorm2: [200x1 double]
         lambda: [200x1 double]

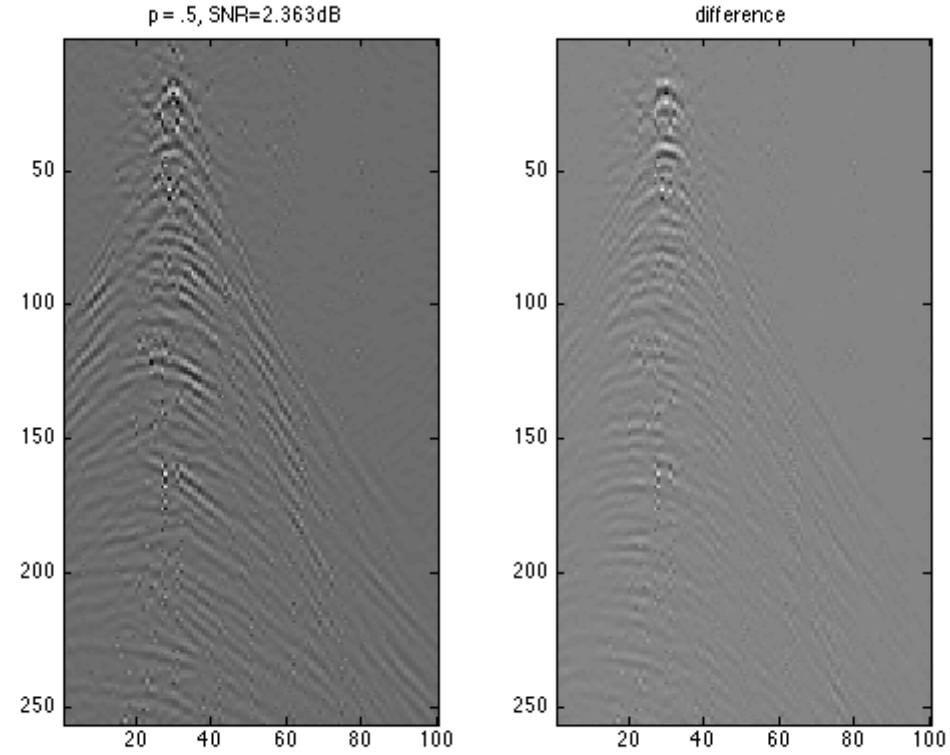

info_pqn1 =

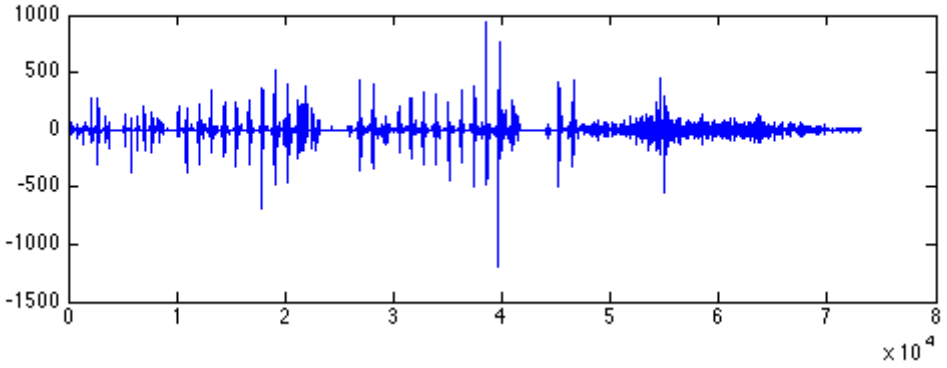
           tau: 2.6318e+05
          rNorm: 25.8787
           rGap: 27.4512
          gNorm: 0.2514
           stat: 5
           iter: 200
         nProdA: 205
        nProdAt: 205
        nNewton: 5
    timeProject: 367.6815
    timeMatProd: 26.3747
        itnLSQR: 0
```

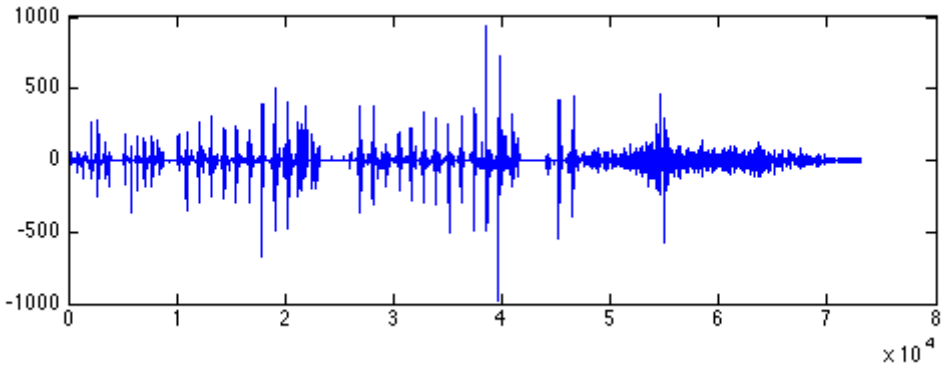
```
    options: [1x1 struct]

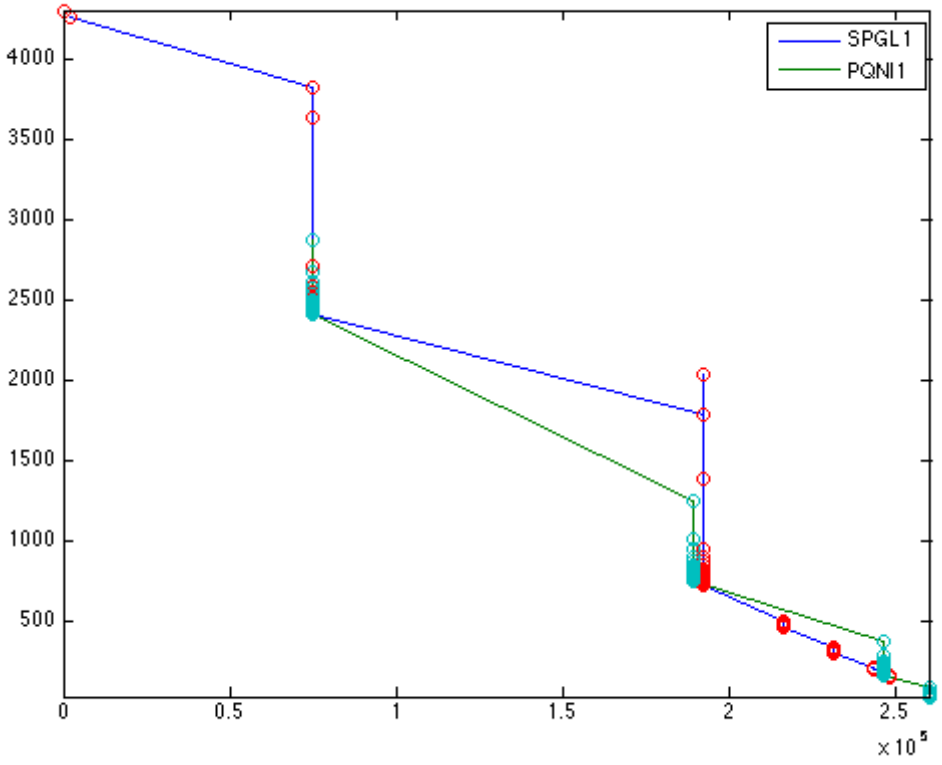
  timeTotal: 437.0248
     xNorm1: [200x1 double]
     rNorm2: [200x1 double]
     lambda: [200x1 double]
```




p = .5, SNR=2.363dB
difference
50
100
150
200
250
20
40
60
80
100


1000
500
0
-500
-1000
-1500
0
1
2
3
4
5
6
7
8
x 10^4


1000
500
0
-500
-1000
0
1
2
3
4
5
6
7
8
x 10^4



if given known strict sparse vector

```
[m n] = size(A); k = .2*round(n/log(m));
p = randperm(n); x0 = zeros(n,1); x0(p(1:k)) = sign(randn(k,1));
figure;plot(x0)
b0  = A*x0;

tau = norm(x0,1);

options = spgSetParms('optTol', 1e-4, 'iterations', 200);%, 'fid', fid);
xinit = zeros(size(A,2),1);

xestspg = spgl1(A,b0,tau,[],xinit,options);
xestpqn = pqnl1_2(A,b0,tau,[],xinit,options);
snrspg = SNR(x0,xestspg);
snrpqn = SNR(x0,xestpqn);

figure('Name','strcit sparse vector SPG');
subplot(2,1,1);plot(xestspg);
title(strcat(['p = .5, SNR=' num2str(snrspg) 'dB']))
subplot(2,1,2);plot(xestspg - x0);
title('difference')

figure('Name','strcit sparse vector PQN');
subplot(2,1,1);plot(xestpqn);
```

```
title(strcat(['p = .5, SNR=' num2str(snrpqn) 'dB']))
subplot(2,1,2);plot(xestpqn - x0);
title('difference')


% BPDN
[x_spg,r_spg,g_spg,info_spg] = spgl1(A, b0, 0, 0, zeros(size(A,2),1), options); %

[x_pqn1,r_pqn1,g_pqn1,info_pqn1] = pqnl1_2(A, b0, 0, 0, zeros(size(A,2),1), option

figure; subplot(2,1,1);plot(x_spg);subplot(2,1,2);plot(x_pqn1);
info_spg
info_pqn1

% show result
figure('Name','Solution paths')
plot(info_spg.xNorm1,info_spg.rNorm2,info_pqn1.xNorm1,info_pqn1.rNorm2);hold on
scatter(info_spg.xNorm1,info_spg.rNorm2);
scatter(info_pqn1.xNorm1,info_pqn1.rNorm2);hold off
legend('SPGL1','PQNl1')
axis tight
```

```
Warning: Size vector should be a row vector with integer
elements.
Warning: Integer operands are required for colon operator
when used as index

 ================================================================================
 SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :    12800      No. columns           :    73051
 Initial tau           : 1.54e+03      Two-norm of b         : 2.32e+01
 Optimality tol        : 1.00e-04      Target one-norm of x  : 1.54e+03
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

  Iter      Objective   Relative Gap      gNorm   stepG    nnzX    nnzG
     0  2.3152016e+01  9.9358216e+00   1.72e+00     0.0       0       0
     1  1.8343786e+01  3.0544424e+01   3.03e+00     0.0   23487       0
     2  1.2416303e+01  5.9056152e+01   2.94e+00     0.0   57490       0
     3  4.7976183e+00  9.6374978e+01   7.35e-01     0.0   54590       0
     4  3.8065722e+00  4.3655620e+01   2.30e-01     0.0   51467       0
     5  3.4371518e+00  4.5278996e+01   1.96e-01     0.0   47922       0
     6  2.2890290e+00  7.0233005e+01   1.38e-01     0.0   35948       0
     7  3.6606565e+00  2.1580463e+02   9.32e-01     0.0   31140       0
     8  3.3750464e+00  2.5350823e+02   9.50e-01     0.0   37958       0
     9  1.6511971e+00  3.7421144e+01   4.47e-02     0.0   34241       0
    10  1.5923524e+00  2.5933683e+01   3.31e-02     0.0   33032       0
    11  1.4744307e+00  2.3357635e+01   2.80e-02     0.0   31036       0
    12  1.1802428e+00  7.3704244e+01   5.62e-02     0.0   27539       0
    13  1.1323120e+00  8.6557780e+01   6.50e-02    -0.3   27962       0
    14  1.0900025e+00  4.2999878e+01   3.63e-02     0.0   27624       0
    15  1.0615858e+00  3.9450280e+01   3.40e-02     0.0   27490       0
    16  1.0359917e+00  1.8714247e+01   2.02e-02     0.0   27287       0
    17  9.9944758e-01  9.5833921e+01   7.00e-02     0.0   26959       0
```

18	9.8553082e-01	1.3181031e+02	9.28e-02	-0.3	26783	0
19	9.5230139e-01	7.7691279e+01	5.79e-02	0.0	26659	0
20	9.3418962e-01	1.2640660e+01	1.56e-02	0.0	26561	0
21	9.1738808e-01	1.4916445e+01	1.70e-02	0.0	26426	0
22	8.3431608e-01	1.5294476e+02	1.05e-01	0.0	25603	0
23	8.6458860e-01	2.6837303e+02	1.80e-01	-0.3	25611	0
24	7.7961996e-01	2.8325409e+01	2.45e-02	0.0	25529	0
25	7.7070933e-01	1.0572401e+01	1.30e-02	0.0	25458	0
26	7.5195756e-01	1.0298980e+01	1.27e-02	0.0	25328	0
27	5.5713909e-01	2.1303403e+02	1.40e-01	0.0	22062	0
28	7.3996185e-01	5.0398791e+02	3.29e-01	-0.3	24294	0
29	4.1673720e-01	1.4405539e+02	9.61e-02	0.0	23965	0
30	3.6927323e-01	1.1126625e+01	9.88e-03	0.0	23939	0
31	3.6198224e-01	9.5059954e+00	8.79e-03	0.0	23922	0
32	3.2570512e-01	7.8636706e+00	7.54e-03	0.0	24041	0
33	3.2541416e-01	2.7489593e+01	2.01e-02	-0.3	23898	0
34	3.3987976e-01	5.8029806e+01	4.00e-02	0.0	23819	0
35	3.0295392e-01	2.0864727e+01	1.58e-02	0.0	23757	0
36	2.9535869e-01	3.5642418e+00	4.58e-03	0.0	23712	0
37	2.9306480e-01	3.3590035e+00	4.43e-03	0.0	23709	0
38	2.7510297e-01	6.4291340e+00	6.29e-03	0.0	23525	0
39	2.9359514e-01	7.6363360e+01	5.15e-02	-0.3	23462	0
40	2.9071726e-01	8.7494237e+01	5.86e-02	-0.3	23467	0
41	2.5231736e-01	6.4302903e+00	6.13e-03	0.0	23382	0
42	2.5062096e-01	2.8980234e+00	3.83e-03	0.0	23356	0
43	2.4527987e-01	2.8435934e+00	3.76e-03	0.0	23280	0
44	2.0879963e-01	4.3485622e+01	2.95e-02	0.0	22635	0
45	1.8927299e-01	2.7634808e+01	1.94e-02	-0.3	22749	0
46	1.7753570e-01	3.6983349e+00	3.79e-03	0.0	22709	0
47	1.7539615e-01	2.3208304e+00	2.89e-03	0.0	22701	0
48	1.7145929e-01	2.4016774e+00	2.90e-03	0.0	22640	0
49	1.7013032e-01	4.5256349e+01	3.06e-02	0.0	22545	0
50	1.5963599e-01	5.9775519e+00	5.11e-03	-0.3	22557	0
51	1.5821146e-01	1.8249205e+00	2.42e-03	0.0	22541	0
52	1.5681071e-01	1.8063393e+00	2.40e-03	0.0	22518	0
53	1.3964354e-01	1.6370563e+01	1.17e-02	0.0	22371	0
54	1.5221703e-01	6.3163069e+01	4.20e-02	-0.3	22405	0
55	1.3718993e-01	2.8888639e+01	1.98e-02	0.0	22386	0
56	1.3304907e-01	1.5627075e+00	2.06e-03	0.0	22376	0
57	1.3244138e-01	1.5497527e+00	2.05e-03	0.0	22375	0
58	1.1579991e-01	3.8281595e+00	3.35e-03	0.0	22212	0
59	1.1931871e-01	1.9986001e+01	1.39e-02	-0.3	22243	0
60	1.1763609e-01	1.9715762e+01	1.36e-02	0.0	22229	0
61	1.1022342e-01	3.5847266e+00	3.19e-03	0.0	22207	0
62	1.0951610e-01	1.2540745e+00	1.67e-03	0.0	22206	0
63	1.0845245e-01	1.2345754e+00	1.65e-03	0.0	22197	0
64	9.2931846e-02	2.4513085e+01	1.65e-02	0.0	22019	0
65	9.1671082e-02	2.7839094e+01	1.87e-02	-0.3	22050	0
66	8.0619444e-02	1.5235948e+00	1.62e-03	0.0	22031	0
67	7.9968480e-02	9.1639619e-01	1.22e-03	0.0	22031	0
68	7.8624983e-02	8.9539211e-01	1.20e-03	0.0	22023	0
69	7.4105250e-02	6.6476887e+00	4.87e-03	0.0	21976	0
70	7.7490547e-02	1.5263003e+01	1.04e-02	-0.3	21994	0
71	7.1232825e-02	5.5333653e+00	4.14e-03	0.0	21967	0

72	7.0494533e-02	7.8825239e-01	1.06e-03	0.0	21967	0
73	7.0104072e-02	7.8302948e-01	1.06e-03	0.0	21967	0
74	6.3250011e-02	4.2357843e+00	3.22e-03	0.0	21925	0
75	6.4480541e-02	1.1311704e+01	7.83e-03	-0.3	21925	0
76	6.1430642e-02	3.0142527e+00	2.43e-03	0.0	21924	0
77	6.0866846e-02	6.7912679e-01	9.19e-04	0.0	21924	0
78	6.0528730e-02	6.7571091e-01	9.14e-04	0.0	21921	0
79	5.1927127e-02	6.8462719e+00	4.82e-03	0.0	21862	0
80	5.3961196e-02	1.1613647e+01	7.91e-03	-0.3	21876	0
81	4.9253680e-02	3.6529972e+00	2.75e-03	0.0	21856	0
82	4.8691106e-02	5.3903630e-01	7.29e-04	0.0	21853	0
83	4.8383636e-02	5.3357857e-01	7.24e-04	0.0	21851	0
84	4.4583467e-02	2.3611709e+00	1.87e-03	0.0	21819	0
85	4.7141427e-02	1.1234414e+01	7.63e-03	-0.3	21816	0
86	4.4181082e-02	6.5031205e+00	4.54e-03	0.0	21813	0
87	4.2376691e-02	5.2392352e-01	6.72e-04	0.0	21812	0
88	4.2194780e-02	4.5951124e-01	6.29e-04	0.0	21811	0
89	3.9585984e-02	1.1879795e+00	1.08e-03	0.0	21790	0
90	4.0083688e-02	6.2816140e+00	4.37e-03	-0.3	21789	0
91	3.9049786e-02	4.6813904e+00	3.32e-03	-0.3	21780	0
92	3.7820149e-02	8.6344513e-01	8.56e-04	0.0	21781	0
93	3.7630069e-02	4.1244783e-01	5.63e-04	0.0	21781	0
94	3.7078836e-02	4.8042991e-01	6.03e-04	0.0	21780	0
95	3.7617503e-02	2.4255246e+01	1.59e-02	0.0	21721	0
96	2.8424312e-02	3.6354627e+00	2.58e-03	-0.3	21719	0
97	2.7578738e-02	3.2870119e-01	4.28e-04	0.0	21719	0
98	2.7333031e-02	3.0655511e-01	4.12e-04	0.0	21719	0
99	2.6228304e-02	1.1811133e+00	9.71e-04	0.0	21710	0
100	2.5835796e-02	5.5507756e-01	5.61e-04	-0.3	21710	0
101	2.5574470e-02	6.7471625e-01	6.38e-04	0.0	21708	0
102	2.5370004e-02	4.5932107e-01	4.95e-04	0.0	21705	0
103	2.5145968e-02	9.7904510e-01	8.32e-04	0.0	21704	0
104	2.5052805e-02	1.9875819e+00	1.48e-03	0.0	21704	0
105	2.4859839e-02	2.3751076e+00	1.73e-03	0.0	21701	0
106	2.4526351e-02	4.7470199e-01	5.00e-04	0.0	21700	0
107	2.4418698e-02	2.6824322e-01	3.65e-04	0.0	21700	0
108	2.3987319e-02	2.7365293e-01	3.65e-04	0.0	21698	0
109	2.3385682e-02	3.7089681e+00	2.58e-03	-0.3	21690	0
110	2.2968393e-02	2.5261375e+00	1.81e-03	-0.3	21687	0
111	2.2536475e-02	3.0341620e-01	3.74e-04	0.0	21688	0
112	2.2449652e-02	2.4606749e-01	3.36e-04	0.0	21688	0
113	2.0946950e-02	6.5036730e-01	5.86e-04	0.0	21680	0
114	2.1313782e-02	5.7308043e+00	3.87e-03	-0.3	21679	0
115	2.1864209e-02	7.2805319e+00	4.88e-03	-0.3	21675	0
116	1.9855591e-02	2.6013914e-01	3.24e-04	0.0	21675	0
117	1.9763553e-02	2.1524136e-01	2.95e-04	0.0	21674	0
118	1.9525022e-02	2.1429119e-01	2.92e-04	0.0	21671	0
119	1.5962986e-02	5.5025999e+00	3.66e-03	0.0	21622	0
120	1.4445392e-02	3.6775821e+00	2.48e-03	-0.3	21619	0
121	1.2624382e-02	4.2453109e-01	3.74e-04	0.0	21619	0
122	1.2518444e-02	1.3319292e-01	1.84e-04	0.0	21619	0
123	1.2282975e-02	1.3407005e-01	1.83e-04	0.0	21620	0
124	1.1621661e-02	1.3986811e+00	9.95e-04	0.0	21614	0
125	1.2182187e-02	2.5143915e+00	1.72e-03	-0.3	21614	0

126	1.1160297e-02	6.2468509e-01	4.92e-04	0.0	21613	0
127	1.1071572e-02	1.2450309e-01	1.67e-04	0.0	21613	0
128	1.1009464e-02	1.2304563e-01	1.66e-04	0.0	21613	0
129	9.6949381e-03	1.1586567e+00	8.24e-04	0.0	21608	0
130	1.0239892e-02	2.8281208e+00	1.91e-03	-0.3	21604	0
131	9.3459000e-03	6.6494959e-01	5.03e-04	0.0	21609	0
132	9.2273073e-03	9.9006438e-02	1.36e-04	0.0	21608	0
133	9.1814741e-03	9.8703890e-02	1.36e-04	0.0	21608	0
134	8.3253697e-03	1.0012093e+00	7.12e-04	0.0	21608	0
135	8.7046013e-03	2.1049404e+00	1.43e-03	-0.3	21606	0
136	8.0188377e-03	7.8296141e-01	5.69e-04	0.0	21606	0
137	7.9116777e-03	9.0423157e-02	1.20e-04	0.0	21606	0
138	7.8723647e-03	8.9225987e-02	1.19e-04	0.0	21606	0
139	7.2119449e-03	4.1148675e-01	3.22e-04	0.0	21588	0
140	7.2533247e-03	1.0924547e+00	7.63e-04	-0.3	21589	0
141	7.0072058e-03	4.9245107e-01	3.73e-04	0.0	21589	0
142	6.9185578e-03	7.3917152e-02	1.02e-04	0.0	21589	0
143	6.8834606e-03	7.3790745e-02	1.02e-04	0.0	21589	0
144	6.4669065e-03	3.7409599e-01	2.93e-04	0.0	21584	0
145	6.4587406e-03	6.1407326e-01	4.48e-04	-0.3	21585	0
146	6.3429579e-03	4.0110045e-01	3.09e-04	0.0	21586	0
147	6.2913576e-03	8.3627919e-02	1.03e-04	0.0	21586	0
148	6.2590503e-03	7.1188342e-02	9.51e-05	0.0	21585	0
149	5.9373014e-03	3.8106177e-01	2.93e-04	0.0	21583	0
150	5.9751207e-03	8.2973542e-01	5.83e-04	-0.3	21583	0
151	5.8280553e-03	3.4182338e-01	2.67e-04	0.0	21583	0
152	5.7883227e-03	6.3267561e-02	8.63e-05	0.0	21583	0
153	5.7580668e-03	6.2979471e-02	8.59e-05	0.0	21583	0
154	4.9291853e-03	9.6848869e-01	6.64e-04	0.0	21578	0
155	5.6666812e-03	2.5021703e+00	1.66e-03	-0.3	21578	0
156	4.6359327e-03	1.4389141e-01	1.29e-04	0.0	21578	0
157	4.6114977e-03	5.1953715e-02	6.98e-05	0.0	21579	0
158	4.5692219e-03	5.1005963e-02	6.88e-05	0.0	21579	0
159	4.0244443e-03	7.1485990e-01	4.91e-04	0.0	21576	0
160	3.9545328e-03	8.0826445e-01	5.53e-04	-0.3	21578	0
161	3.6013964e-03	9.7665923e-02	9.12e-05	0.0	21578	0
162	3.5732307e-03	6.3655760e-02	6.90e-05	0.0	21578	0
163	3.5086964e-03	3.6907915e-02	5.13e-05	0.0	21577	0
164	3.3121086e-03	3.7262120e-01	2.67e-04	0.0	21576	0
165	3.4216014e-03	8.5589702e-01	5.80e-04	-0.3	21575	0
166	3.2140393e-03	2.6771042e-01	1.98e-04	0.0	21575	0
167	3.1842260e-03	3.5561409e-02	4.79e-05	0.0	21575	0
168	3.1676961e-03	3.5232130e-02	4.76e-05	0.0	21575	0
169	2.8023988e-03	2.2978942e-01	1.70e-04	0.0	21575	0
170	2.9515950e-03	9.1627633e-01	6.15e-04	-0.3	21575	0
171	2.7331037e-03	4.8378157e-01	3.34e-04	0.0	21575	0
172	2.6367314e-03	3.0383083e-02	4.03e-05	0.0	21575	0
173	2.6242453e-03	2.7965547e-02	3.86e-05	0.0	21576	0
174	2.4947292e-03	1.1116633e-01	9.16e-05	0.0	21576	0
175	2.5009358e-03	3.8731976e-01	2.70e-04	-0.3	21576	0
176	2.5042602e-03	5.5523950e-01	3.79e-04	0.0	21576	0
177	2.4170180e-03	3.9424845e-02	4.44e-05	0.0	21576	0
178	2.4071037e-03	2.6364423e-02	3.59e-05	0.0	21575	0
179	2.3734783e-03	2.6047171e-02	3.54e-05	0.0	21574	0

```
  180  1.8019058e-03  7.3938115e-01   4.90e-04     0.0   21566       0

 EXIT -- Optimal solution found

 Products with A     :     248        Total time   (secs) :    25.1
 Products with A'    :     181        Project time (secs) :     1.9
 Newton iterations   :       0        Mat-vec time (secs) :    21.0
 Line search its     :     149        Subspace iterations :       0


 ================================================================================
 PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :    12800      No. columns           :    73051
 Initial tau           : 1.54e+03      Two-norm of b         : 2.32e+01
 Optimality tol        : 1.00e-04      Target one-norm of x  : 1.54e+03
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

  Iter      Objective   Relative Gap      gNorm   stepG    nnzX    nnzG
     0  2.3152016e+01  9.9358216e+00   1.72e+00     0.0       0       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          1           4     5.00000e-01     1.38043e+01     1.510
         2          1          11     1.00000e+00     6.86348e+00     1.021
         3          1          18     1.00000e+00     4.88325e+00     5.382
         4          1          26     1.00000e+00     3.45353e+00     3.220
         5          1          35     1.00000e+00     2.49363e+00     2.338
         6          1          48     1.00000e+00     2.05118e+00     1.594
         7          1          58     1.00000e+00     1.86065e+00     1.217
         8          1          72     1.00000e+00     1.59626e+00     9.789
         9          1          87     1.00000e+00     1.38842e+00     8.780
        10          1         107     1.00000e+00     1.14330e+00     6.908
        11          1         120     1.00000e+00     9.84294e-01     5.608
        12          1         136     1.00000e+00     8.88301e-01     4.921
        13          1         152     1.00000e+00     7.64797e-01     4.324
        14          1         170     1.00000e+00     6.59355e-01     3.623
        15          1         191     1.00000e+00     5.65268e-01     3.167
        16          1         214     1.00000e+00     5.00987e-01     2.576
        17          1         244     1.00000e+00     4.40854e-01     2.282
        18          1         271     1.00000e+00     3.78861e-01     2.033
        19          1         294     1.00000e+00     3.28967e-01     1.862
        20          1         320     1.00000e+00     2.89373e-01     1.579
        21          1         356     1.00000e+00     2.48041e-01     1.408
        22          1         391     1.00000e+00     2.12871e-01     1.260
        23          1         431     1.00000e+00     1.81241e-01     1.136
        24          1         456     1.00000e+00     1.58013e-01     9.681
        25          1         480     1.00000e+00     1.34354e-01     7.340
        26          1         510     1.00000e+00     1.13323e-01     6.941
        27          1         549     1.00000e+00     9.61268e-02     6.453
        28          1         574     1.00000e+00     8.04487e-02     5.156
        29          1         621     1.00000e+00     6.40733e-02     4.331
        30          1         654     1.00000e+00     5.41354e-02     3.847
        31          1         688     1.00000e+00     4.49716e-02     3.373
        32          1         724     1.00000e+00     3.37154e-02     2.637
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        33          1         764     1.00000e+00     2.59878e-02     2.244
        34          1         801     1.00000e+00     2.05066e-02     1.822
        35          1         846     1.00000e+00     1.56264e-02     1.440
        36          1         899     1.00000e+00     1.13423e-02     1.126
        37          1         939     1.00000e+00     8.70243e-03     8.496
        38          1        1003     1.00000e+00     6.45919e-03     6.459
        39          1        1059     1.00000e+00     4.19415e-03     4.758
        40          1        1126     1.00000e+00     2.78602e-03     3.670
        41          1        1148     1.00000e+00     1.98212e-03     2.373
        42          1        1193     1.00000e+00     1.38863e-03     1.716
        43          1        1240     1.00000e+00     8.23880e-04     1.116
        44          1        1290     1.00000e+00     5.56843e-04     9.272
        45          1        1309     1.00000e+00     3.24237e-04     4.822
        46          1        1369     1.00000e+00     2.40326e-04     3.474
        47          1        1402     1.00000e+00     1.45839e-04     2.033
        48          1        1444     1.00000e+00     7.96204e-05     1.492
Optimal solution found
    48  7.9620379e-05  1.9470023e-02   1.29e-05     0.0   23878       0
 EXIT -- Optimal solution found

 Products with A     :      51        Total time   (secs) :   128.2
 Products with A'    :      51        Project time (secs) :   125.1
 Newton iterations   :       0        Mat-vec time (secs) :     5.8


 ================================================================================
 SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :    12800      No. columns           :    73051
 Initial tau           : 0.00e+00      Two-norm of b         : 2.32e+01
 Optimality tol        : 1.00e-04      Target objective      : 0.00e+00
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

  Iter      Objective   Relative Gap  Rel Error      gNorm   stepG    nnzX
     0  2.3152016e+01  0.0000000e+00   1.00e+00  1.725e+00     0.0       0
     1  2.3066414e+01  1.7425052e+00   1.00e+00  1.491e+00    -0.3       1
     2  1.7261866e+01  6.6130655e+00   1.00e+00  3.110e+00     0.0    1328
     3  1.5484595e+01  5.8837962e+00   1.00e+00  2.529e+00     0.0    2215
     4  1.4271672e+01  1.3510637e+00   1.00e+00  7.432e-01     0.0    1867
     5  1.4069439e+01  6.1953999e-01   1.00e+00  5.172e-01     0.0    1745
     6  1.3995520e+01  3.3285421e-01   1.00e+00  4.282e-01     0.0    1609
     7  1.3837666e+01  9.7310974e-01   1.00e+00  6.311e-01     0.0    1306
     8  1.3847227e+01  1.2661562e+00   1.00e+00  7.129e-01    -0.3    1196
     9  1.3780171e+01  1.7876712e+00   1.00e+00  8.761e-01     0.0    1167
    10  1.3752884e+01  1.5835124e-01   1.00e+00  3.790e-01     0.0    1159
    11  1.3745476e+01  2.9012231e-01   1.00e+00  4.193e-01     0.0    1139
    12  1.3727465e+01  1.3686696e-01   1.00e+00  3.727e-01     0.0    1098
    13  1.3698012e+01  7.7853381e-01   1.00e+00  5.626e-01     0.0     876
    14  1.3684851e+01  1.1252244e-01   1.00e+00  3.623e-01    -0.3     909
    15  1.3677110e+01  7.0159573e-01   1.00e+00  5.409e-01     0.0     895
    16  1.3673857e+01  9.0975594e-02   1.00e+00  3.572e-01     0.0     899
    17  1.3672259e+01  2.5407573e-01   1.00e+00  4.064e-01     0.0     894
    18  1.3670767e+01  8.1725750e-02   1.00e+00  3.546e-01     0.0     885
    19  1.3668603e+01  2.7243311e-01   1.00e+00  4.121e-01     0.0     864
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20	1.3668541e+01	4.7651241e-02	1.00e+00	3.442e-01	-0.3	861
21	8.0825225e+00	9.0456759e+00	1.00e+00	3.843e-01	0.0	20336
22	7.0490819e+00	1.1321054e+01	1.00e+00	4.149e-01	0.0	22578
23	6.5825253e+00	4.2072340e+00	1.00e+00	1.810e-01	0.0	18161
24	6.4059763e+00	3.6336717e+00	1.00e+00	1.637e-01	0.0	16665
25	6.2479456e+00	2.9559687e+00	1.00e+00	1.411e-01	0.0	14674
26	5.9629488e+00	1.1968035e+01	1.00e+00	3.173e-01	0.0	10583
27	5.8940222e+00	1.9451987e+00	1.00e+00	1.062e-01	-0.3	10696
28	5.8577538e+00	2.2689107e+00	1.00e+00	1.126e-01	0.0	10409
29	5.8141237e+00	1.9003095e+00	1.00e+00	1.039e-01	0.0	9921
30	5.6686122e+00	1.2315770e+01	1.00e+00	2.962e-01	0.0	7858
31	5.6971565e+00	1.4096577e+01	1.00e+00	3.300e-01	-0.3	7925
32	5.6163250e+00	3.6776128e+00	1.00e+00	1.319e-01	0.0	7874
33	5.6065750e+00	1.7112718e+00	1.00e+00	9.527e-02	0.0	7784
34	5.5858749e+00	1.6838011e+00	1.00e+00	9.432e-02	0.0	7551
35	5.5700370e+00	1.5301248e+01	1.00e+00	3.367e-01	0.0	4539
36	5.5633230e+00	2.9566303e+01	1.00e+00	5.963e-01	-0.3	5190
37	5.4476800e+00	1.7294060e+01	1.00e+00	3.592e-01	0.0	5526
38	5.3985530e+00	1.1340262e+00	1.00e+00	7.955e-02	0.0	5541
39	5.3877764e+00	1.0601721e+00	1.00e+00	7.818e-02	0.0	5503
40	5.3611272e+00	6.1558581e+00	1.00e+00	1.648e-01	0.0	5310
41	5.3768564e+00	8.5436870e+00	1.00e+00	2.049e-01	-0.3	5262
42	5.3504386e+00	4.1984831e+00	1.00e+00	1.316e-01	0.0	5249
43	5.3477602e+00	9.9589833e-01	1.00e+00	7.778e-02	0.0	5237
44	5.3457803e+00	9.8739843e-01	1.00e+00	7.764e-02	0.0	5221
45	5.3326528e+00	7.1065558e+00	1.00e+00	1.795e-01	0.0	4820
46	5.3361006e+00	9.0094429e+00	1.00e+00	2.121e-01	-0.3	4881
47	5.3165954e+00	7.8416740e-01	1.00e+00	7.411e-02	0.0	4881
48	5.3130031e+00	7.6830421e-01	1.00e+00	7.395e-02	0.0	4878
49	5.3103018e+00	7.5385874e-01	1.00e+00	7.374e-02	0.0	4853
50	5.3071090e+00	1.1810112e+00	1.00e+00	8.070e-02	0.0	4817
51	5.3085238e+00	7.3440256e+00	1.00e+00	1.822e-01	0.0	4671
52	5.3021353e+00	7.4802570e-01	1.00e+00	7.334e-02	-0.3	4687
53	5.2982087e+00	1.2496993e+00	1.00e+00	8.161e-02	0.0	4680
54	5.2961330e+00	7.1165077e-01	1.00e+00	7.275e-02	0.0	4662
55	5.2936734e+00	2.3265787e+00	1.00e+00	9.931e-02	0.0	4612
56	5.2928485e+00	6.6891106e-01	1.00e+00	7.203e-02	-0.3	4617
57	5.2919802e+00	1.4917248e+00	1.00e+00	8.556e-02	0.0	4607
58	5.2912034e+00	6.4073612e-01	1.00e+00	7.157e-02	0.0	4599
59	5.2898211e+00	1.9693281e+00	1.00e+00	9.335e-02	0.0	4576
60	5.2901230e+00	7.6731964e-01	1.00e+00	7.360e-02	-0.3	4556
61	5.2885242e+00	5.7098271e+00	1.00e+00	1.546e-01	0.0	4535
62	5.2872917e+00	5.8810945e-01	1.00e+00	7.068e-02	0.0	4538
63	5.2865984e+00	9.6450427e-01	1.00e+00	7.685e-02	0.0	4528
64	5.2862259e+00	5.8275901e-01	1.00e+00	7.059e-02	0.0	4526
65	5.2828251e+00	5.6371272e-01	1.00e+00	7.025e-02	0.0	4487
66	5.2782908e+00	7.0540397e+00	1.00e+00	1.763e-01	-0.3	4475
67	5.2817985e+00	4.7246543e+00	1.00e+00	1.382e-01	-0.3	4511
68	5.2746143e+00	2.2566561e+00	1.00e+00	9.787e-02	0.0	4484
69	5.2741961e+00	1.0221091e+00	1.00e+00	7.774e-02	0.0	4473
70	5.2737323e+00	5.5900474e-01	1.00e+00	7.018e-02	0.0	4456
71	5.2714057e+00	1.0718718e+00	1.00e+00	7.840e-02	0.0	4347
72	5.2741460e+00	7.7404377e+00	1.00e+00	1.871e-01	-0.3	4344
73	5.2700165e+00	6.3757237e-01	1.00e+00	7.134e-02	-0.3	4376

74	5.2689364e+00	1.4591034e+00	1.00e+00	8.474e-02	0.0	4352
75	5.2683014e+00	3.3828714e-01	1.00e+00	6.651e-02	0.0	4336
76	5.2677117e+00	9.3014858e-01	1.00e+00	7.613e-02	0.0	4303
77	5.2679405e+00	1.1661576e+00	1.00e+00	7.988e-02	0.0	4271
78	2.8472500e+00	3.8377364e+01	1.00e+00	1.343e-01	0.0	25692
79	2.5482557e+00	6.4258311e+01	1.00e+00	1.955e-01	0.0	31993
80	2.2712191e+00	5.3244769e+01	1.00e+00	1.300e-01	0.0	27506
81	2.1843335e+00	1.5802100e+01	1.00e+00	4.847e-02	0.0	26072
82	2.1497583e+00	8.1759616e+00	1.00e+00	3.277e-02	0.0	24697
83	2.0601775e+00	2.9571584e+01	1.00e+00	6.984e-02	0.0	20699
84	2.1458158e+00	1.7514562e+02	1.00e+00	3.511e-01	-0.3	18523
85	2.1211457e+00	1.6362794e+02	1.00e+00	3.234e-01	0.0	18227
86	1.9842337e+00	9.0292778e+00	1.00e+00	3.154e-02	0.0	17974
87	1.9786618e+00	5.3266765e+00	1.00e+00	2.542e-02	0.0	17752
88	1.9385689e+00	8.0949594e+00	1.00e+00	2.939e-02	0.0	16129
89	1.9491109e+00	1.2972466e+02	1.00e+00	2.206e-01	-0.3	13562
90	1.8947522e+00	3.5169059e+01	1.00e+00	6.867e-02	-0.3	13871
91	1.8740493e+00	8.8959043e+00	1.00e+00	2.904e-02	0.0	13794
92	1.8671164e+00	4.3924226e+00	1.00e+00	2.254e-02	0.0	13681
93	1.8554911e+00	1.0383479e+01	1.00e+00	3.113e-02	0.0	13305
94	1.8628010e+00	1.1458736e+02	1.00e+00	1.814e-01	0.0	12696
95	1.8408781e+00	7.2781580e+00	1.00e+00	2.618e-02	-0.3	12747
96	1.8360780e+00	9.7609122e+00	1.00e+00	2.967e-02	0.0	12682
97	1.8325090e+00	3.6330912e+00	1.00e+00	2.112e-02	0.0	12587
98	1.8251450e+00	2.5928618e+01	1.00e+00	5.200e-02	0.0	12320
99	1.8333459e+00	9.0608035e+01	1.00e+00	1.427e-01	-0.3	12256
100	1.8251001e+00	7.6098303e+01	1.00e+00	1.215e-01	0.0	12204
101	1.8167839e+00	3.3035495e+00	1.00e+00	2.051e-02	0.0	12152
102	1.8158241e+00	3.2977832e+00	1.00e+00	2.050e-02	0.0	12107
103	1.8065954e+00	3.8653440e+00	1.00e+00	2.118e-02	0.0	11769
104	1.7951077e+00	5.2343483e+01	1.00e+00	8.635e-02	-0.3	11682
105	1.7925570e+00	4.1609772e+01	1.00e+00	7.153e-02	-0.3	11758
106	1.7850976e+00	1.9968528e+01	1.00e+00	4.247e-02	0.0	11628
107	1.7834251e+00	2.6784100e+00	1.00e+00	1.948e-02	0.0	11563
108	1.7816490e+00	4.8325156e+00	1.00e+00	2.228e-02	0.0	11455
109	1.7755620e+00	1.8183782e+01	1.00e+00	3.953e-02	0.0	10970
110	1.7732227e+00	2.3316956e+01	1.00e+00	4.630e-02	-0.3	11003
111	1.7714386e+00	3.1343085e+00	1.00e+00	1.982e-02	0.0	10960
112	1.7703078e+00	5.9483214e+00	1.00e+00	2.351e-02	0.0	10939
113	1.7694085e+00	2.8029026e+00	1.00e+00	1.939e-02	0.0	10910
114	1.7640651e+00	2.5193774e+01	1.00e+00	4.839e-02	0.0	10707
115	1.7643756e+00	2.1960891e+01	1.00e+00	4.415e-02	-0.3	10708
116	1.7620586e+00	1.3315042e+01	1.00e+00	3.294e-02	0.0	10678
117	1.7615035e+00	2.8032640e+00	1.00e+00	1.934e-02	0.0	10659
118	1.7605615e+00	2.7967955e+00	1.00e+00	1.932e-02	0.0	10617
119	1.7493005e+00	9.9972118e+01	1.00e+00	1.431e-01	-0.3	9642
120	1.7574354e+00	1.1667191e+02	1.00e+00	1.659e-01	-0.3	9677
121	1.7355817e+00	2.9440261e+00	1.00e+00	1.937e-02	0.0	9691
122	1.7347524e+00	2.5068247e+00	1.00e+00	1.882e-02	0.0	9690
123	1.7318646e+00	2.3456102e+00	1.00e+00	1.855e-02	0.0	9699
124	1.7280644e+00	1.4639934e+01	1.00e+00	3.378e-02	0.0	9676
125	1.7324829e+00	6.1496802e+01	1.00e+00	9.234e-02	-0.3	9672
126	1.7264647e+00	1.8486888e+01	1.00e+00	3.849e-02	-0.3	9684
127	1.7256306e+00	2.2249252e+00	1.00e+00	1.830e-02	0.0	9666

128	1.7252334e+00	2.1408717e+00	1.00e+00	1.820e-02	0.0	9660
129	1.7239188e+00	2.1079650e+00	1.00e+00	1.816e-02	0.0	9610
130	1.7244163e+00	5.4364790e+01	1.00e+00	8.282e-02	-0.3	9534
131	1.7217364e+00	3.6272905e+00	1.00e+00	1.997e-02	-0.3	9553
132	1.7212215e+00	6.0636381e+00	1.00e+00	2.299e-02	0.0	9546
133	1.7208371e+00	2.0317908e+00	1.00e+00	1.803e-02	0.0	9535
134	1.7196922e+00	8.0589042e+00	1.00e+00	2.546e-02	0.0	9510
135	1.7192562e+00	2.1383119e+00	1.00e+00	1.815e-02	-0.3	9495
136	1.7192190e+00	3.3740663e+01	1.00e+00	5.704e-02	0.0	9483
137	1.3393078e+00	3.5557581e+01	1.00e+00	3.854e-02	0.0	22412
138	1.3018385e+00	8.2847545e+01	1.00e+00	7.683e-02	0.0	18253
139	1.3014971e+00	1.5381247e+02	1.00e+00	1.331e-01	0.0	15955
140	1.2862630e+00	8.8344993e+01	1.00e+00	8.109e-02	0.0	15289
141	1.2808131e+00	4.2111504e+00	1.00e+00	1.391e-02	0.0	14897
142	1.2791465e+00	4.8127079e+00	1.00e+00	1.440e-02	0.0	14545
143	1.2703830e+00	3.2862489e+00	1.00e+00	1.347e-02	0.0	12406
144	1.2783039e+00	1.5949712e+02	1.00e+00	1.378e-01	-0.3	11830
145	1.2697911e+00	5.6705964e+01	1.00e+00	5.580e-02	-0.3	11745
146	1.2658331e+00	1.0101728e+01	1.00e+00	1.869e-02	0.0	11719
147	1.2654522e+00	4.4014860e+00	1.00e+00	1.417e-02	0.0	11689
148	1.2637166e+00	5.6028799e+00	1.00e+00	1.530e-02	0.0	11460
149	1.2626296e+00	1.0098930e+01	1.00e+00	1.851e-02	0.0	11130
150	1.2642709e+00	5.6743495e+01	1.00e+00	5.637e-02	-0.3	11083
151	1.2635761e+00	6.0971819e+01	1.00e+00	5.945e-02	0.0	11040
152	1.2593749e+00	2.0851526e+01	1.00e+00	2.747e-02	0.0	11018
153	1.2590316e+00	2.9212021e+00	1.00e+00	1.315e-02	0.0	11002
154	1.2587786e+00	3.3798884e+00	1.00e+00	1.351e-02	0.0	10987
155	1.2555546e+00	3.5265696e+01	1.00e+00	3.874e-02	0.0	10540
156	1.2548583e+00	3.8568603e+01	1.00e+00	4.165e-02	-0.3	10564
157	1.2520992e+00	5.3107860e+00	1.00e+00	1.506e-02	0.0	10554
158	1.2515726e+00	2.2705630e+00	1.00e+00	1.264e-02	0.0	10550
159	1.2512481e+00	2.2559530e+00	1.00e+00	1.263e-02	0.0	10536
160	1.2499575e+00	3.3718534e+01	1.00e+00	3.778e-02	0.0	10476
161	1.2509294e+00	3.5608664e+01	1.00e+00	3.923e-02	-0.3	10471
162	1.2488877e+00	1.0818108e+01	1.00e+00	1.947e-02	0.0	10464
163	1.2487447e+00	2.8936320e+00	1.00e+00	1.314e-02	0.0	10461
164	1.2484965e+00	2.9061476e+00	1.00e+00	1.314e-02	0.0	10451
165	1.2456870e+00	7.9159418e+01	1.00e+00	7.396e-02	0.0	10097
166	1.2471090e+00	7.3506528e+01	1.00e+00	6.958e-02	-0.3	10142
167	1.2403139e+00	4.7217582e+00	1.00e+00	1.459e-02	0.0	10126
168	1.2397755e+00	4.1147372e+00	1.00e+00	1.411e-02	0.0	10122
169	1.2386186e+00	3.2132822e+00	1.00e+00	1.338e-02	0.0	10111
170	1.2383072e+00	4.5421059e+01	1.00e+00	4.707e-02	0.0	10097
171	1.2373903e+00	3.9179757e+00	1.00e+00	1.393e-02	-0.3	10100
172	1.2372376e+00	5.1311067e+00	1.00e+00	1.490e-02	0.0	10094
173	1.2370547e+00	2.3850788e+00	1.00e+00	1.271e-02	0.0	10093
174	1.2356411e+00	4.2859364e+00	1.00e+00	1.422e-02	0.0	10051
175	1.2350537e+00	1.4912394e+01	1.00e+00	2.270e-02	-0.3	10049
176	1.2354977e+00	2.5994075e+01	1.00e+00	3.152e-02	-0.3	10042
177	1.2349608e+00	3.3374041e+01	1.00e+00	3.743e-02	0.0	10038
178	1.2341762e+00	5.8986600e+00	1.00e+00	1.550e-02	0.0	10033
179	1.2340656e+00	2.9636897e+00	1.00e+00	1.315e-02	0.0	10028
180	1.2338784e+00	2.1091687e+00	1.00e+00	1.247e-02	0.0	10019
181	1.2313748e+00	7.0139694e+00	1.00e+00	1.637e-02	0.0	9930

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  182  1.2313177e+00  1.8569805e+01   1.00e+00  2.559e-02    -0.3    9944
  183  8.1915042e-01  7.4594766e+01   8.19e-01  6.111e-02     0.0   19417
  184  8.1079111e-01  1.4974940e+02   8.11e-01  1.203e-01     0.0   18460
  185  7.7581670e-01  8.7234055e+01   7.76e-01  7.219e-02     0.0   17919
  186  7.5738432e-01  1.0096526e+01   7.57e-01  1.346e-02     0.0   17621
  187  7.5513733e-01  3.2088549e+00   7.55e-01  8.226e-03     0.0   17342
  188  7.4780641e-01  3.6362013e+00   7.48e-01  8.625e-03     0.0   16103
  189  7.4071028e-01  1.6115558e+01   7.41e-01  1.839e-02     0.0   14003
  190  7.3829778e-01  1.0338300e+01   7.38e-01  1.386e-02    -0.3   13974
  191  7.3686458e-01  8.6325291e+00   7.37e-01  1.257e-02     0.0   13850
  192  7.3618350e-01  6.1240565e+00   7.36e-01  1.064e-02     0.0   13775
  193  7.3562229e-01  5.9597616e+00   7.36e-01  1.051e-02     0.0   13695
  194  7.3487160e-01  8.1160922e+00   7.35e-01  1.213e-02     0.0   13519
  195  7.3514073e-01  3.2026298e+01   7.35e-01  3.037e-02     0.0   13328
  196  7.3525831e-01  2.9176405e+01   7.35e-01  2.817e-02     0.0   13257
  197  7.3313999e-01  8.1603392e+00   7.33e-01  1.217e-02     0.0   13221
  198  7.3293494e-01  1.8139428e+00   7.33e-01  7.330e-03     0.0   13199
  199  7.3245022e-01  2.3994132e+00   7.32e-01  7.776e-03     0.0   13102
  200  7.2870020e-01  2.4267126e+01   7.29e-01  2.452e-02    -0.3   12246

 ERROR EXIT -- Too many iterations

 Products with A     :     274        Total time   (secs) :    28.5
 Products with A'    :     201        Project time (secs) :     2.4
 Newton iterations   :       5        Mat-vec time (secs) :    23.8
 Line search its     :     113        Subspace iterations :       0


 ================================================================================
 PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :    12800      No. columns           :    73051
 Initial tau           : 0.00e+00      Two-norm of b         : 2.32e+01
 Optimality tol        : 1.00e-04      Target objective      : 0.00e+00
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

     0  2.3152016e+01  0.0000000e+00   1.00e+00  1.725e+00     0.0       0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          1           4     1.00000e+00     1.65657e+01     2.911
         2          1          10     1.00000e+00     1.47382e+01     1.582
         3          1          18     1.00000e+00     1.43350e+01     9.439
         4          1          26     1.00000e+00     1.41142e+01     6.795
         5          1          36     1.00000e+00     1.39448e+01     4.646
         6          1          46     1.00000e+00     1.38421e+01     3.331
         7          1          58     1.00000e+00     1.37808e+01     2.554
         8          1          69     1.00000e+00     1.37421e+01     2.078
         9          1          81     1.00000e+00     1.37142e+01     1.712
        10          1          95     1.00000e+00     1.36944e+01     1.225
        11          1         108     1.00000e+00     1.36841e+01     9.631
        12          1         124     1.00000e+00     1.36773e+01     7.923
break of testUpdateTau    12  1.3677337e+01  1.1705387e-01   1.00e+00  3.6
```

```
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        13          1           4     1.00000e+00     1.02456e+01     7.524
        14          1          12     1.00000e+00     7.22529e+00     3.149
        15          1          19     1.00000e+00     6.83163e+00     1.913
        16          1          27     1.00000e+00     6.50245e+00     1.276
        17          1          37     1.00000e+00     6.27788e+00     9.406
        18          1          47     1.00000e+00     6.11552e+00     6.452
        19          1          59     1.00000e+00     6.02442e+00     4.888
        20          1          71     1.00000e+00     5.95759e+00     4.048
        21          1          84     1.00000e+00     5.89852e+00     3.461
        22          1          99     1.00000e+00     5.84623e+00     3.024
        23          1         114     1.00000e+00     5.80832e+00     2.603
        24          1         127     1.00000e+00     5.77799e+00     2.283
        25          1         144     1.00000e+00     5.75156e+00     2.074
        26          1         163     1.00000e+00     5.73078e+00     1.906
        27          1         182     1.00000e+00     5.71200e+00     1.703
        28          1         199     1.00000e+00     5.69517e+00     1.483
        29          1         217     1.00000e+00     5.68188e+00     1.320
        30          1         236     1.00000e+00     5.67142e+00     1.180
        31          1         251     1.00000e+00     5.66275e+00     1.143
        32          1         266     1.00000e+00     5.65610e+00     1.084
        33          1         282     1.00000e+00     5.64966e+00     9.244
        34          1         298     1.00000e+00     5.64397e+00     8.079
        35          1         315     1.00000e+00     5.63990e+00     7.679
        36          1         336     1.00000e+00     5.63627e+00     7.246
        37          1         365     1.00000e+00     5.63274e+00     6.815
        38          1         386     1.00000e+00     5.62996e+00     6.248
break of testUpdateTau    38  5.6299568e+00  4.5811211e-01   1.00e+00  7.5

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        39          1           4     1.00000e+00     3.07069e+00     4.476
        40          1          11     1.00000e+00     2.27809e+00     1.792
        41          1          19     1.00000e+00     2.09050e+00     1.098
        42          1          27     1.00000e+00     1.93198e+00     7.221
        43          1          36     1.00000e+00     1.83110e+00     5.527
        44          1          48     1.00000e+00     1.75912e+00     4.325
        45          1          61     1.00000e+00     1.71052e+00     3.509
        46          1          72     1.00000e+00     1.66003e+00     2.842
        47          1          88     1.00000e+00     1.62016e+00     2.385
        48          1         103     1.00000e+00     1.58811e+00     2.091
        49          1         120     1.00000e+00     1.56238e+00     1.878
        50          1         136     1.00000e+00     1.54035e+00     1.703
        51          1         153     1.00000e+00     1.51867e+00     1.551
        52          1         172     1.00000e+00     1.49927e+00     1.437
        53          1         188     1.00000e+00     1.48261e+00     1.338
        54          1         207     1.00000e+00     1.46792e+00     1.269
        55          1         225     1.00000e+00     1.45373e+00     1.184
        56          1         252     1.00000e+00     1.44248e+00     1.070
        57          1         277     1.00000e+00     1.43115e+00     9.812
        58          1         287     1.00000e+00     1.42428e+00     8.623
        59          1         305     1.00000e+00     1.41629e+00     7.546
        60          1         325     1.00000e+00     1.40815e+00     7.589
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          61           1         349     1.00000e+00     1.40093e+00     7.897
          62           1         375     1.00000e+00     1.39371e+00     7.622
          63           1         395     1.00000e+00     1.38622e+00     6.798
          64           1         425     1.00000e+00     1.37950e+00     6.307
          65           1         445     1.00000e+00     1.37351e+00     6.264
          66           1         475     1.00000e+00     1.36770e+00     6.373
          67           1         499     1.00000e+00     1.36264e+00     6.094
          68           1         521     1.00000e+00     1.35702e+00     5.732
          69           1         540     1.00000e+00     1.35284e+00     5.453
          70           1         568     1.00000e+00     1.34850e+00     5.315
          71           1         581     1.00000e+00     1.34586e+00     5.041
          72           1         596     1.00000e+00     1.34283e+00     5.033
          73           1         617     1.00000e+00     1.33929e+00     5.228
          74           1         639     1.00000e+00     1.33628e+00     4.930
          75           1         679     1.00000e+00     1.33306e+00     4.612
          76           1         709     1.00000e+00     1.33013e+00     4.551
          77           1         738     1.00000e+00     1.32779e+00     4.495
          78           1         770     1.00000e+00     1.32476e+00     4.595
          79           1         797     1.00000e+00     1.32246e+00     4.317
          80           1         829     1.00000e+00     1.32013e+00     3.855
          81           1         856     1.00000e+00     1.31816e+00     3.598
          82           1         884     1.00000e+00     1.31614e+00     3.692
          83           1         907     1.00000e+00     1.31440e+00     3.613
          84           1         940     1.00000e+00     1.31260e+00     3.381
          85           1         967     1.00000e+00     1.31060e+00     3.430
          86           1         994     1.00000e+00     1.30929e+00     3.299
          87           1        1026     1.00000e+00     1.30772e+00     3.083
          88           1        1047     1.00000e+00     1.30609e+00     3.287
          89           1        1085     1.00000e+00     1.30499e+00     3.164
          90           1        1118     1.00000e+00     1.30345e+00     2.792
          91           1        1150     1.00000e+00     1.30224e+00     2.788
          92           1        1184     1.00000e+00     1.30117e+00     2.795
          93           1        1210     1.00000e+00     1.30006e+00     2.627
          94           1        1240     1.00000e+00     1.29898e+00     2.498
          95           1        1273     1.00000e+00     1.29796e+00     2.512
          96           1        1299     1.00000e+00     1.29694e+00     2.590
          97           1        1330     1.00000e+00     1.29618e+00     2.392
          98           1        1360     1.00000e+00     1.29515e+00     2.237
          99           1        1399     1.00000e+00     1.29443e+00     2.251
         100           1        1427     1.00000e+00     1.29371e+00     2.211
         101           1        1458     1.00000e+00     1.29295e+00     2.170
         102           1        1492     1.00000e+00     1.29228e+00     2.163
         103           1        1523     1.00000e+00     1.29158e+00     2.136
         104           1        1552     1.00000e+00     1.29099e+00     2.017
break of testUpdateTau   104  1.2909942e+00  1.4684936e+00   1.00e+00  1.2

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         105           1           4     1.00000e+00     6.76225e-01     1.396
         106           1          10     1.00000e+00     4.58520e-01     5.501
         107           1          18     1.00000e+00     3.98991e-01     3.210
         108           1          26     1.00000e+00     3.49975e-01     1.871
         109           1          34     1.00000e+00     3.22786e-01     1.401
         110           1          46     1.00000e+00     3.05493e-01     1.134
```

111	1	58	1.00000e+00	2.94303e-01	9.449
112	1	70	1.00000e+00	2.80256e-01	7.182
113	1	84	1.00000e+00	2.69454e-01	6.035
114	1	100	1.00000e+00	2.61477e-01	5.416
115	1	119	1.00000e+00	2.54796e-01	4.911
116	1	136	1.00000e+00	2.48858e-01	4.411
117	1	153	1.00000e+00	2.43347e-01	3.897
118	1	170	1.00000e+00	2.38429e-01	3.512
119	1	193	1.00000e+00	2.34414e-01	3.257
120	1	209	1.00000e+00	2.31028e-01	3.010
121	1	235	1.00000e+00	2.27656e-01	2.797
122	1	252	1.00000e+00	2.24518e-01	2.608
123	1	268	1.00000e+00	2.21772e-01	2.465
124	1	286	1.00000e+00	2.18953e-01	2.373
125	1	305	1.00000e+00	2.16485e-01	2.255
126	1	332	1.00000e+00	2.14200e-01	2.098
127	1	348	1.00000e+00	2.12044e-01	1.960
128	1	372	1.00000e+00	2.10079e-01	1.885
129	1	393	1.00000e+00	2.08345e-01	1.845
130	1	410	1.00000e+00	2.06781e-01	1.768
131	1	430	1.00000e+00	2.05134e-01	1.686
132	1	454	1.00000e+00	2.03684e-01	1.644
133	1	478	1.00000e+00	2.02459e-01	1.569
134	1	503	1.00000e+00	2.01086e-01	1.513
135	1	532	1.00000e+00	1.99788e-01	1.478
136	1	560	1.00000e+00	1.98581e-01	1.398
137	1	584	1.00000e+00	1.97361e-01	1.331
138	1	607	1.00000e+00	1.96309e-01	1.307
139	1	628	1.00000e+00	1.95352e-01	1.244
140	1	648	1.00000e+00	1.94384e-01	1.197
141	1	681	1.00000e+00	1.93447e-01	1.194
142	1	700	1.00000e+00	1.92570e-01	1.176
143	1	722	1.00000e+00	1.91697e-01	1.136
144	1	756	1.00000e+00	1.90884e-01	1.102
145	1	778	1.00000e+00	1.90069e-01	1.092
146	1	808	1.00000e+00	1.89331e-01	1.055
147	1	839	1.00000e+00	1.88594e-01	1.035
148	1	863	1.00000e+00	1.87923e-01	1.015
149	1	897	1.00000e+00	1.87230e-01	9.977
150	1	918	1.00000e+00	1.86529e-01	9.883
151	1	947	1.00000e+00	1.85845e-01	9.625
152	1	971	1.00000e+00	1.85220e-01	9.195
153	1	1001	1.00000e+00	1.84596e-01	8.928
154	1	1029	1.00000e+00	1.84009e-01	8.711
155	1	1056	1.00000e+00	1.83435e-01	8.639
156	1	1092	1.00000e+00	1.82866e-01	8.516
157	1	1120	1.00000e+00	1.82390e-01	8.154
158	1	1149	1.00000e+00	1.81953e-01	7.732
159	1	1171	1.00000e+00	1.81457e-01	7.796
160	1	1205	1.00000e+00	1.80978e-01	8.066
161	1	1241	1.00000e+00	1.80543e-01	7.697
162	1	1282	1.00000e+00	1.80051e-01	7.232
163	1	1314	1.00000e+00	1.79609e-01	7.219
164	1	1348	1.00000e+00	1.79136e-01	7.822

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      165          1       1379     1.00000e+00     1.78747e-01     7.795
      166          1       1407     1.00000e+00     1.78249e-01     7.567
      167          1       1439     1.00000e+00     1.77858e-01     7.131
      168          1       1466     1.00000e+00     1.77461e-01     6.995
      169          1       1488     1.00000e+00     1.77115e-01     6.879
      170          1       1513     1.00000e+00     1.76737e-01     6.762
      171          1       1550     1.00000e+00     1.76346e-01     6.976
      172          1       1574     1.00000e+00     1.76019e-01     6.701
      173          1       1609     1.00000e+00     1.75642e-01     6.536
      174          1       1648     1.00000e+00     1.75342e-01     6.362
      175          1       1684     1.00000e+00     1.74997e-01     6.376
      176          1       1729     1.00000e+00     1.74656e-01     6.430
      177          1       1753     1.00000e+00     1.74355e-01     6.184
      178          1       1793     1.00000e+00     1.74072e-01     6.003
      179          1       1829     1.00000e+00     1.73757e-01     6.136
      180          1       1846     1.00000e+00     1.73547e-01     5.590
      181          1       1877     1.00000e+00     1.73170e-01     5.622
      182          1       1916     1.00000e+00     1.72900e-01     5.892
      183          1       1978     1.00000e+00     1.72596e-01     5.697
      184          1       2012     1.00000e+00     1.72309e-01     5.276
      185          1       2056     1.00000e+00     1.72029e-01     5.122
      186          1       2099     1.00000e+00     1.71758e-01     5.336
      187          1       2133     1.00000e+00     1.71468e-01     5.679
      188          1       2162     1.00000e+00     1.71193e-01     5.574
      189          1       2214     1.00000e+00     1.70854e-01     5.695
      190          1       2242     1.00000e+00     1.70648e-01     5.370
      191          1       2298     1.00000e+00     1.70369e-01     5.167
      192          1       2323     1.00000e+00     1.70143e-01     5.252
      193          1       2371     1.00000e+00     1.69862e-01     5.520
      194          1       2390     1.00000e+00     1.69672e-01     5.151
      195          1       2418     1.00000e+00     1.69447e-01     4.583
      196          1       2454     1.00000e+00     1.69208e-01     4.916
      197          1       2492     1.00000e+00     1.68996e-01     5.018
      198          1       2525     1.00000e+00     1.68766e-01     4.715
      199          1       2564     1.00000e+00     1.68517e-01     4.512
      200          1       2599     1.00000e+00     1.68306e-01     4.713
  200  1.6830564e-01  3.7373865e-01   1.68e-01  1.642e-03     0.0   12128

 ERROR EXIT -- Too many iterations

 Products with A     :     205        Total time   (secs) :   498.9
 Products with A'    :     205        Project time (secs) :   450.0
 Newton iterations   :       5        Mat-vec time (secs) :    25.3

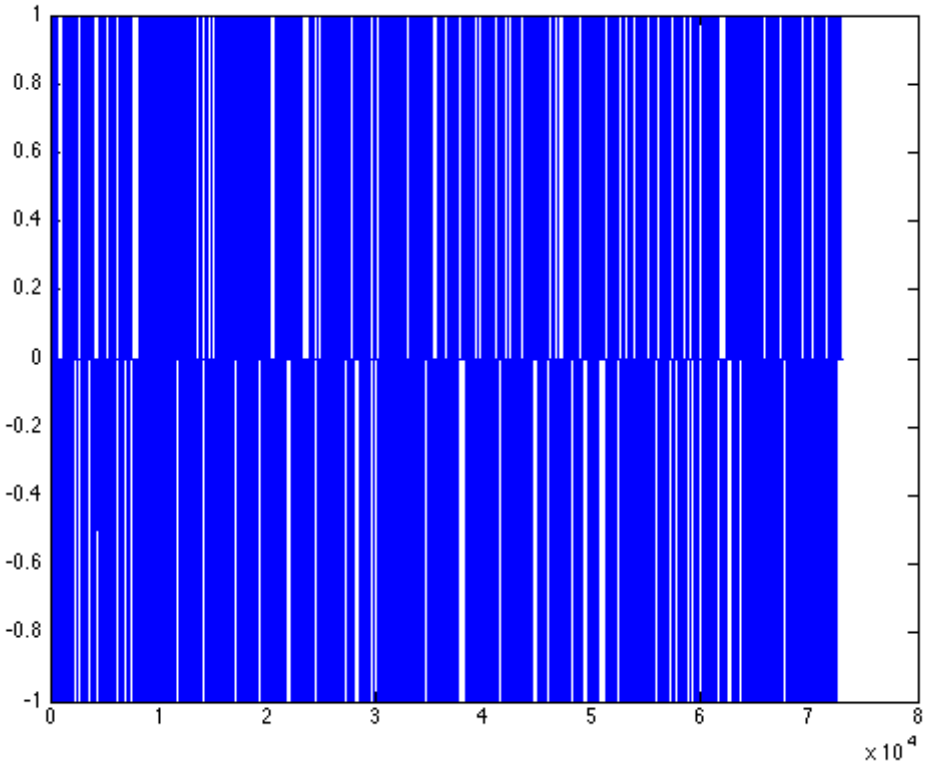

info_spg =

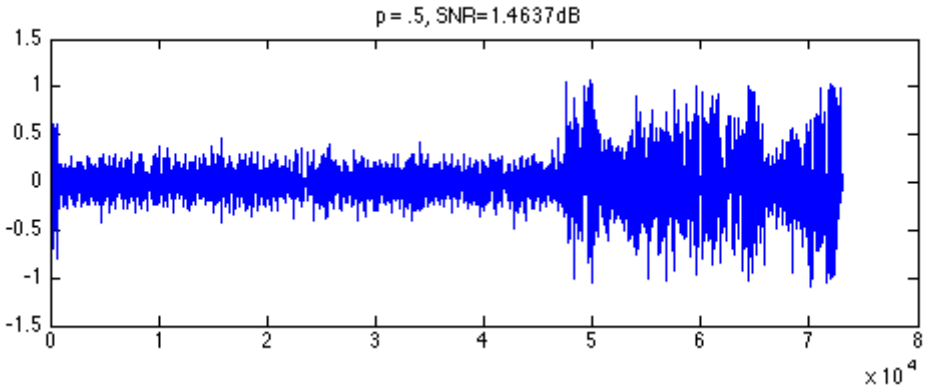
           tau: 1.3120e+03
          rNorm: 0.7287
           rGap: 24.2671
          gNorm: 0.0245
           stat: 5
           iter: 200
         nProdA: 274
```

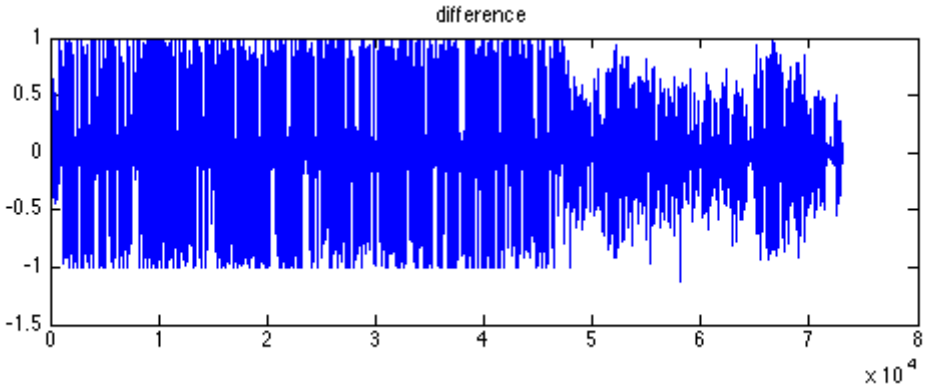
```
        nProdAt: 201
        nNewton: 5
    timeProject: 2.3873
    timeMatProd: 23.7659
        itnLSQR: 0
        options: [1x1 struct]
      timeTotal: 28.5267
         xNorm1: [200x1 double]
         rNorm2: [200x1 double]
         lambda: [200x1 double]

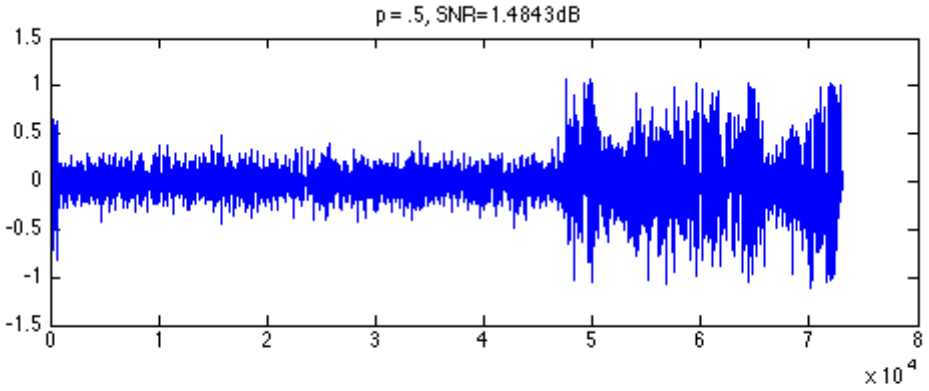

info_pqn1 =

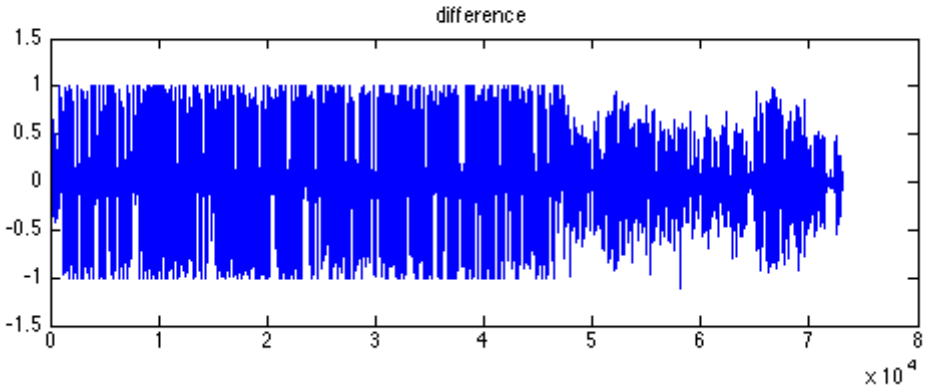
            tau: 1.3910e+03
          rNorm: 0.1683
           rGap: 0.3737
          gNorm: 0.0016
           stat: 5
           iter: 200
         nProdA: 205
        nProdAt: 205
        nNewton: 5
    timeProject: 450.0319
    timeMatProd: 25.3231
        itnLSQR: 0
        options: [1x1 struct]
      timeTotal: 498.8639
         xNorm1: [200x1 double]
         rNorm2: [200x1 double]
         lambda: [200x1 double]
```

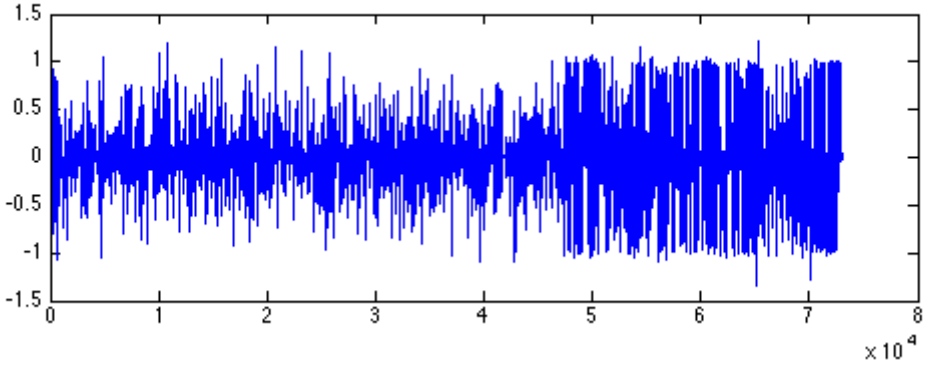

1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6
7
8
x 10^4

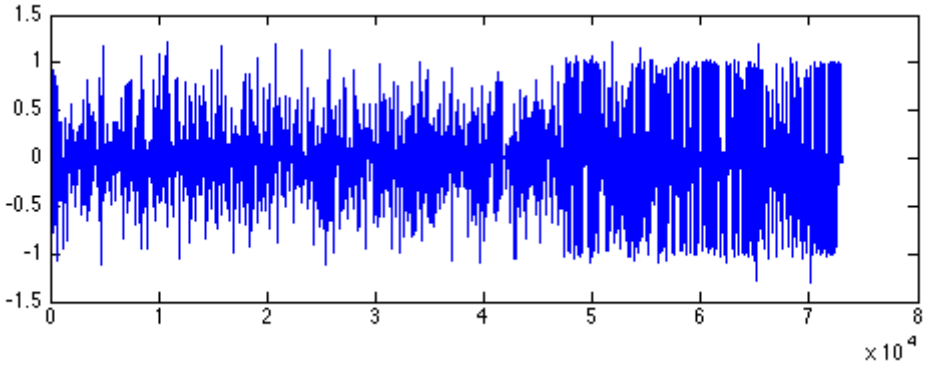

p = .5, SNR= 1.4637dB
1.5
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
8
x 10^4

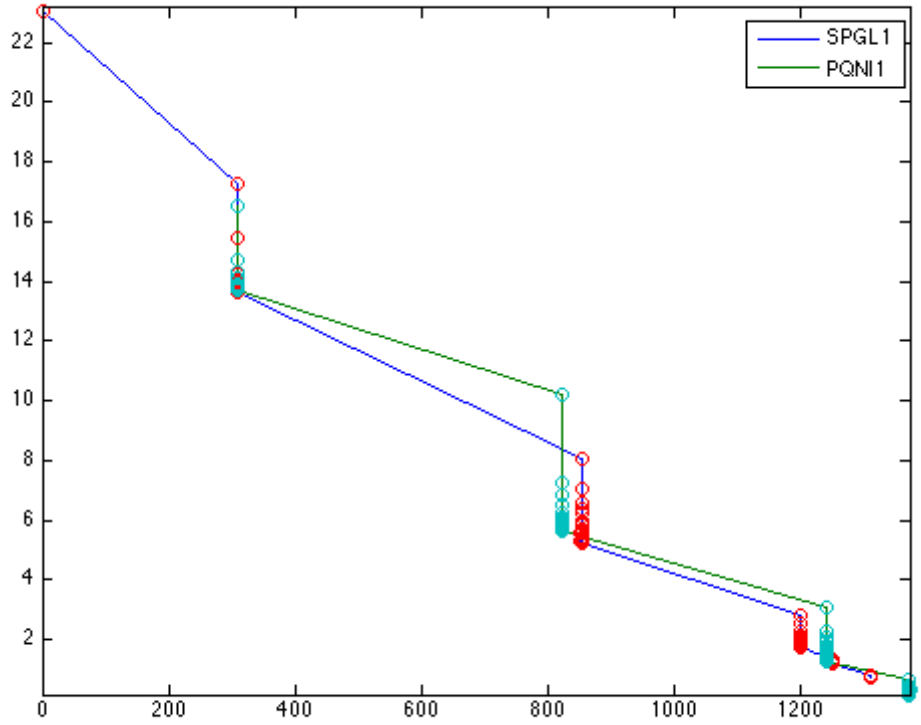

difference
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
8
x 10^4


p = .5, SNR= 1.4843dB
1.5
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
8
x 10^4


difference
1.5
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
8
x 10^4


1.5
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
8
x 10^4


1.5
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
8
x 10^4



if given known compressible vector

```
nn = linspace(0,1,n);
x0_compress = exp(-nn.^.1);
x0_compress = x0_compress - min(x0_compress);
figure;plot(x0_compress)
x0_compress = x0_compress(:);
b_compress  = A*x0_compress + 0.005 * randn(m,1);


tau = norm(x0_compress,1);

options = spgSetParms('optTol', 1e-4, 'iterations', 200);%, 'fid', fid);
xinit = zeros(size(A,2),1);

xestspg = spgl1(A,b_compress,tau,[],xinit,options);
xestpqn = pqnl1_2(A,b_compress,tau,[],xinit,options);
snrspg = SNR(x0_compress,xestspg);
snrpqn = SNR(x0_compress,xestpqn);

figure('Name','compressible vector SPG');
subplot(2,1,1);plot(xestspg);
title(strcat(['p = .5, SNR=' num2str(snrspg) 'dB']))
subplot(2,1,2);plot(xestspg - x0_compress);
title('difference')
```

```
figure('Name','compressible vector PQN');
subplot(2,1,1);plot(xestpqn);
title(strcat(['p = .5, SNR=' num2str(snrpqn) 'dB']))
subplot(2,1,2);plot(xestpqn - x0_compress);
title('difference')


% BPDN
[x_spg,r_spg,g_spg,info_spg] = spgl1(A, b_compress, 0, 0, zeros(size(A,2),1), opti

[x_pqn1,r_pqn1,g_pqn1,info_pqn1] = pqnl1_2(A, b_compress, 0, 0, zeros(size(A,2),1)

figure; subplot(2,1,1);plot(x_spg);subplot(2,1,2);plot(x_pqn1);
info_spg
info_pqn1

% show result
figure('Name','Solution paths')
plot(info_spg.xNorm1,info_spg.rNorm2,info_pqn1.xNorm1,info_pqn1.rNorm2);hold on
scatter(info_spg.xNorm1,info_spg.rNorm2);
scatter(info_pqn1.xNorm1,info_pqn1.rNorm2);hold off
legend('SPGL1','PQNl1')
axis tight
```

```
================================================================================
SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
================================================================================
No. rows              :    12800      No. columns           :    73051
Initial tau           : 2.66e+03      Two-norm of b         : 9.73e+00
Optimality tol        : 1.00e-04      Target one-norm of x  : 2.66e+03
Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

 Iter      Objective   Relative Gap      gNorm   stepG    nnzX    nnzG
    0  9.7323992e+00  6.9071896e+01   1.23e+00     0.0       0       0
    1  7.9367341e+00  1.4279177e+02   1.65e+00    -0.3   63986       0
    2  3.4938085e+00  3.6895213e+02   8.47e-01     0.0   61073       0
    3  1.1416320e+00  3.7024826e+02   1.39e-01     0.0   60157       0
    4  8.7506291e-01  1.2708014e+02   4.84e-02     0.0   59843       0
    5  6.7098709e-01  9.3325242e+01   3.56e-02     0.0   59827       0
    6  2.5613176e-01  7.6609776e+01   2.89e-02     0.0   60097       0
    7  5.3454746e-01  4.0185894e+02   1.50e-01     0.0   60468       0
    8  2.5461768e-01  1.2841267e+02   4.83e-02     0.0   60201       0
    9  1.9155339e-01  4.7118292e+00   1.78e-03     0.0   60130       0
   10  1.9027207e-01  3.3679646e+00   1.28e-03     0.0   60117       0
   11  1.8923296e-01  1.2924524e+00   4.99e-04     0.0   60132       0
   12  1.8916901e-01  3.3406996e-01   1.26e-04     0.0   60134       0
   13  1.8915765e-01  2.2645605e-01   8.73e-05     0.0   60136       0
   14  1.8915606e-01  4.6044091e-01   1.72e-04     0.0   60130       0
   15  1.8915649e-01  7.5525760e-01   2.84e-04     0.0   60129       0
   16  1.8915367e-01  1.5654548e-01   5.93e-05     0.0   60128       0
   17  1.8915352e-01  3.1147763e-02   1.20e-05     0.0   60128       0
   18  1.8915347e-01  2.5893710e-02   9.91e-06     0.0   60127       0
```

```
   19  1.8915339e-01  7.1237505e-03   2.66e-06     0.0   60128       0
   20  1.8915340e-01  3.7505946e-02   1.42e-05     0.0   60125       0
   21  1.8915339e-01  3.7967605e-02   1.42e-05     0.0   60125       0
   22  1.8915339e-01  7.2633520e-03   2.73e-06     0.0   60125       0
   23  1.8915339e-01  3.3560695e-04   1.25e-07     0.0   60125       0
   24  1.8915339e-01  1.3644555e-04   5.09e-08     0.0   60125       0
   25  1.8915339e-01  3.3345774e-05   1.28e-08     0.0   60125       0

 EXIT -- Optimal solution found

 Products with A     :      27        Total time   (secs) :     4.0
 Products with A'    :      26        Project time (secs) :     0.1
 Newton iterations   :       0        Mat-vec time (secs) :     3.5
 Line search its     :       1        Subspace iterations :       0


 ================================================================================
 PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :    12800      No. columns           :    73051
 Initial tau           : 2.66e+03      Two-norm of b         : 9.73e+00
 Optimality tol        : 1.00e-04      Target one-norm of x  : 2.66e+03
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

  Iter      Objective   Relative Gap      gNorm   stepG    nnzX    nnzG
     0  9.7323992e+00  6.9071896e+01   1.23e+00     0.0       0       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          1           4     2.50000e-01     4.05478e+00     8.745
         2          1          11     1.00000e+00     2.04558e+00     4.021
         3          1          19     1.00000e+00     1.20738e+00     2.322
         4          1          29     1.00000e+00     6.29248e-01     1.353
         5          1          39     1.00000e+00     4.26482e-01     1.093
         6          1          48     1.00000e+00     2.37381e-01     3.571
         7          1          58     1.00000e+00     2.00003e-01     1.559
         8          1          68     1.00000e+00     1.89384e-01     2.374
         9          1          79     1.00000e+00     1.89156e-01     2.725
        10          1          87     1.00000e+00     1.89153e-01     5.446
        11          1          96     1.00000e+00     1.89153e-01     2.620
        12          1         102     1.00000e+00     1.89153e-01     1.974
Directional Derivative below optTol
        13          1         140     1.00000e+00     1.89153e-01     1.142
Function value changing by less than optTol
    13  1.8915339e-01  1.3172980e-04   4.97e-08     0.0   60125       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
        14          1           4     5.00000e-01     1.89153e-01     1.305
Function value changing by less than optTol
    14  1.8915339e-01  3.1098819e-04   1.17e-07     0.0   60125       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        15          1           4     2.50000e-01     1.89153e-01     9.211
Function value changing by less than optTol
```

```
    15  1.8915339e-01  2.3588581e-04   8.86e-08     0.0   60125       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
        16         1          4     2.50000e-01     1.89153e-01     6.603
Function value changing by less than optTol
    16  1.8915339e-01  1.7672089e-04   6.66e-08     0.0   60125       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
        17         1          4     2.50000e-01     1.89153e-01     4.902
Function value changing by less than optTol
    17  1.8915339e-01  1.3521273e-04   5.07e-08     0.0   60125       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
        18         1          4     2.50000e-01     1.89153e-01     3.597
Function value changing by less than optTol
    18  1.8915339e-01  1.0042160e-04   3.79e-08     0.0   60125       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
        19         1          4     2.50000e-01     1.89153e-01     2.706
Function value changing by less than optTol
    19  1.8915339e-01  7.6702969e-05   2.88e-08     0.0   60125       0
 EXIT -- Optimal solution found

 Products with A     :      40        Total time   (secs) :    16.9
 Products with A'    :      40        Project time (secs) :     7.3
 Newton iterations   :       0        Mat-vec time (secs) :     5.4


 ================================================================================
 SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :    12800      No. columns           :    73051
 Initial tau           : 0.00e+00      Two-norm of b         : 9.73e+00
 Optimality tol        : 1.00e-04      Target objective      : 0.00e+00
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

  Iter      Objective   Relative Gap  Rel Error      gNorm   stepG    nnzX
     0  9.7323992e+00  0.0000000e+00   1.00e+00  1.228e+00     0.0       0
     1  9.5823013e+00  2.1603977e+00   1.00e+00  1.285e+00    -0.3       1
     2  8.5772912e+00  4.2649904e+00   1.00e+00  1.420e+00    -0.3     402
     3  5.2634868e+00  1.1745159e+00   1.00e+00  4.417e-01     0.0    1042
     4  5.0771619e+00  7.8942865e-01   1.00e+00  3.594e-01     0.0     725
     5  5.0553509e+00  4.1149092e-01   1.00e+00  3.052e-01     0.0     720
     6  5.0442098e+00  2.4925273e-01   1.00e+00  2.760e-01     0.0     715
     7  5.0374965e+00  4.6872419e-01   1.00e+00  3.177e-01     0.0     709
     8  5.0472446e+00  3.5018063e-01   1.00e+00  2.864e-01     0.0     701
     9  5.0239093e+00  1.6038817e-01   1.00e+00  2.647e-01     0.0     702
    10  5.0215426e+00  1.3203983e-01   1.00e+00  2.597e-01     0.0     699
    11  5.0186786e+00  1.1405713e-01   1.00e+00  2.569e-01     0.0     696
    12  5.0020736e+00  2.4862544e-01   1.00e+00  2.798e-01     0.0     643
```

13	5.0030498e+00	3.2836711e-01	1.00e+00	2.917e-01	-0.3	653
14	4.9988226e+00	1.8315316e-01	1.00e+00	2.688e-01	0.0	650
15	4.9974383e+00	6.4012972e-02	1.00e+00	2.496e-01	0.0	654
16	4.9969933e+00	6.5209375e-02	1.00e+00	2.497e-01	0.0	651
17	4.9934519e+00	4.2873765e-02	1.00e+00	2.452e-01	0.0	638
18	4.9930988e+00	8.0137751e-02	1.00e+00	2.514e-01	-0.3	640
19	4.9929229e+00	9.1774643e-02	1.00e+00	2.529e-01	0.0	638
20	2.8802299e+00	4.1840268e+00	1.00e+00	1.356e-01	0.0	12044
21	2.5822013e+00	3.8961133e+00	1.00e+00	1.212e-01	0.0	8609
22	2.5121809e+00	1.8937737e+00	1.00e+00	6.224e-02	0.0	6525
23	2.4835536e+00	1.7264934e+00	1.00e+00	6.629e-02	0.0	5906
24	2.4691193e+00	1.0982438e+00	1.00e+00	5.075e-02	0.0	5342
25	2.4566557e+00	1.3812998e+00	1.00e+00	5.889e-02	0.0	4842
26	2.4546012e+00	1.2429621e+00	1.00e+00	4.898e-02	0.0	4144
27	2.4516155e+00	4.3043713e+00	1.00e+00	1.125e-01	0.0	4095
28	2.4357250e+00	8.4867726e-01	1.00e+00	4.761e-02	0.0	3923
29	2.4338422e+00	8.0508374e-01	1.00e+00	4.733e-02	0.0	3854
30	2.4253313e+00	6.8698363e-01	1.00e+00	4.569e-02	0.0	3499
31	2.4256570e+00	4.4259563e+00	1.00e+00	1.090e-01	0.0	2824
32	2.4186210e+00	1.6020106e+00	1.00e+00	5.969e-02	-0.3	2861
33	2.4102750e+00	3.5279885e-01	1.00e+00	4.048e-02	0.0	2879
34	2.4098030e+00	3.7253692e-01	1.00e+00	4.071e-02	0.0	2871
35	2.4084273e+00	3.8383877e-01	1.00e+00	4.097e-02	0.0	2879
36	2.4072165e+00	4.3814598e-01	1.00e+00	4.146e-02	0.0	2830
37	2.4068664e+00	4.3250262e-01	1.00e+00	4.206e-02	-0.3	2832
38	2.4066289e+00	3.4985449e-01	1.00e+00	4.018e-02	0.0	2819
39	2.4064561e+00	3.2468112e-01	1.00e+00	4.007e-02	0.0	2816
40	2.4062840e+00	3.3295316e-01	1.00e+00	4.001e-02	0.0	2803
41	2.4060802e+00	5.0041810e-01	1.00e+00	4.318e-02	0.0	2793
42	2.4059214e+00	3.2590397e-01	1.00e+00	3.974e-02	-0.3	2785
43	2.4057387e+00	2.9988154e-01	1.00e+00	3.964e-02	0.0	2781
44	2.4056468e+00	3.0204731e-01	1.00e+00	3.960e-02	0.0	2775
45	1.4198763e+00	2.8290593e+01	1.00e+00	7.819e-02	0.0	15035
46	1.2067503e+00	2.8498474e+01	1.00e+00	1.018e-01	0.0	23757
47	9.2930928e-01	9.8291150e+00	9.29e-01	3.577e-02	0.0	20174
48	8.8524207e-01	2.7113118e+00	8.85e-01	1.527e-02	0.0	19607
49	8.6633547e-01	2.1622658e+00	8.66e-01	1.360e-02	0.0	18778
50	8.2511054e-01	5.9737012e+00	8.25e-01	2.665e-02	0.0	15789
51	8.3609192e-01	2.2060611e+01	8.36e-01	7.411e-02	-0.3	14893
52	8.2141128e-01	2.1273566e+01	8.21e-01	7.391e-02	0.0	14718
53	8.0287086e-01	1.7917109e+00	8.03e-01	1.271e-02	0.0	14534
54	8.0080998e-01	9.4276858e-01	8.01e-01	1.005e-02	0.0	14435
55	7.9682238e-01	9.4296958e-01	7.97e-01	1.006e-02	0.0	14121
56	7.8139554e-01	1.2597643e+01	7.81e-01	4.688e-02	0.0	11545
57	7.7685154e-01	1.0789233e+01	7.77e-01	4.046e-02	-0.3	11628
58	7.7112127e-01	5.6049861e+00	7.71e-01	2.448e-02	0.0	11627
59	7.6954267e-01	6.6988286e-01	7.70e-01	9.129e-03	0.0	11617
60	7.6802523e-01	1.6980227e+00	7.68e-01	1.229e-02	0.0	11582
61	7.6554778e-01	4.9456879e+00	7.66e-01	2.235e-02	0.0	11438
62	7.6732855e-01	1.5979085e+01	7.67e-01	5.660e-02	-0.3	11347
63	7.6348126e-01	3.6490702e+00	7.63e-01	1.832e-02	0.0	11330
64	7.6272090e-01	6.3911447e-01	7.63e-01	8.969e-03	0.0	11311
65	7.6240920e-01	5.5694220e-01	7.62e-01	8.713e-03	0.0	11294
66	7.5515943e-01	1.3170544e+00	7.55e-01	1.120e-02	0.0	10448

67	7.5514522e-01	3.3179376e+00	7.55e-01	1.660e-02	-0.3	10490
68	5.0978495e-01	1.1162334e+01	5.10e-01	3.456e-02	0.0	16975
69	4.9213519e-01	1.9936535e+01	4.92e-01	5.897e-02	0.0	15954
70	4.7883517e-01	1.4552476e+01	4.79e-01	4.446e-02	0.0	15611
71	4.7123185e-01	2.4198232e+00	4.71e-01	1.028e-02	0.0	15402
72	4.6955049e-01	5.1550276e-01	4.70e-01	4.930e-03	0.0	15241
73	4.6551028e-01	1.3116337e+00	4.66e-01	7.228e-03	0.0	14658
74	4.6503364e-01	1.5548464e+01	4.65e-01	4.729e-02	0.0	13431
75	4.6034844e-01	8.8168223e-01	4.60e-01	6.117e-03	-0.3	13392
76	4.5902598e-01	3.9625508e-01	4.59e-01	4.726e-03	0.0	13373
77	4.5845632e-01	3.7197021e-01	4.58e-01	4.642e-03	0.0	13319
78	4.5673206e-01	5.4004560e-01	4.57e-01	5.080e-03	0.0	13054
79	4.5829724e-01	4.9821634e+00	4.58e-01	1.772e-02	0.0	12533
80	4.5512279e-01	1.0706839e+00	4.55e-01	6.659e-03	-0.3	12552
81	4.5372855e-01	8.7104281e-01	4.54e-01	6.081e-03	0.0	12523
82	4.5328772e-01	4.1008535e-01	4.53e-01	4.770e-03	0.0	12503
83	4.5284551e-01	9.0031157e-01	4.53e-01	6.128e-03	0.0	12452
84	4.5308825e-01	4.0486627e+00	4.53e-01	1.496e-02	0.0	12362
85	4.5219641e-01	2.3446491e+00	4.52e-01	1.017e-02	-0.3	12324
86	4.5195584e-01	4.4560663e-01	4.52e-01	4.843e-03	0.0	12320
87	4.5186077e-01	3.3429849e-01	4.52e-01	4.531e-03	0.0	12307
88	4.5146419e-01	8.6825964e-01	4.51e-01	6.031e-03	0.0	12254
89	4.5119731e-01	2.1079405e+00	4.51e-01	9.509e-03	-0.3	12201
90	4.5145964e-01	6.1336052e+00	4.51e-01	2.081e-02	-0.3	12167
91	4.5079367e-01	2.0182242e+00	4.51e-01	9.257e-03	0.0	12157
92	4.5064725e-01	2.9404511e-01	4.51e-01	4.417e-03	0.0	12149
93	4.5056931e-01	2.7806999e-01	4.51e-01	4.372e-03	0.0	12135
94	4.4822562e-01	1.8654389e+00	4.48e-01	8.885e-03	0.0	11706
95	4.4871604e-01	3.8260110e+00	4.49e-01	1.428e-02	-0.3	11716
96	4.4753598e-01	1.4594355e+00	4.48e-01	7.688e-03	0.0	11700
97	4.4730588e-01	2.4702010e-01	4.47e-01	4.282e-03	0.0	11689
98	4.4718350e-01	3.1804361e-01	4.47e-01	4.483e-03	0.0	11683
99	4.4686398e-01	1.8331326e+00	4.47e-01	8.748e-03	0.0	11621
100	4.4676715e-01	2.3856076e-01	4.47e-01	4.262e-03	-0.3	11618
101	4.4669603e-01	5.7222015e-01	4.47e-01	5.197e-03	0.0	11603
102	4.4662602e-01	2.4765705e-01	4.47e-01	4.285e-03	0.0	11595
103	4.4641931e-01	1.2426435e+00	4.46e-01	7.074e-03	0.0	11561
104	4.4634919e-01	4.0804708e-01	4.46e-01	4.734e-03	-0.3	11552
105	4.4627342e-01	9.3361303e-01	4.46e-01	6.207e-03	0.0	11538
106	4.4620893e-01	3.6121424e-01	4.46e-01	4.601e-03	0.0	11536
107	4.4612934e-01	7.3795684e-01	4.46e-01	5.657e-03	0.0	11528
108	4.4605049e-01	1.0440368e+00	4.46e-01	6.518e-03	0.0	11522
109	4.4599620e-01	2.5395932e+00	4.46e-01	1.071e-02	0.0	11509
110	4.4587901e-01	1.2635605e+00	4.46e-01	7.134e-03	0.0	11510
111	4.4577475e-01	4.1576726e-01	4.46e-01	4.751e-03	0.0	11497
112	4.4573498e-01	2.3786519e-01	4.46e-01	4.252e-03	0.0	11489
113	4.4542699e-01	5.4430811e-01	4.45e-01	5.111e-03	0.0	11460
114	4.4530746e-01	2.0198766e+00	4.45e-01	9.257e-03	-0.3	11426
115	4.4511108e-01	2.3016136e-01	4.45e-01	4.227e-03	-0.3	11420
116	4.4496891e-01	2.3325753e-01	4.45e-01	4.235e-03	0.0	11409
117	4.4489381e-01	2.3014210e-01	4.45e-01	4.227e-03	0.0	11397
118	4.4400481e-01	5.3559041e-01	4.44e-01	5.082e-03	0.0	11266
119	4.4401951e-01	1.5390412e+00	4.44e-01	7.913e-03	-0.3	11251
120	3.1025567e-01	9.9584810e+00	3.10e-01	2.642e-02	0.0	14254

121	3.1171853e-01	2.0513824e+01	3.12e-01	5.618e-02	0.0	14286
122	2.8165373e-01	8.9120177e+00	2.82e-01	2.471e-02	0.0	14223
123	2.7669533e-01	1.0064152e+00	2.77e-01	4.087e-03	0.0	14275
124	2.7572885e-01	3.5745978e-01	2.76e-01	2.397e-03	0.0	14313
125	2.7258629e-01	8.9037683e-01	2.73e-01	3.886e-03	0.0	14393
126	2.7393029e-01	8.9854027e+00	2.74e-01	2.496e-02	0.0	14184
127	2.7555918e-01	1.2725363e+01	2.76e-01	3.498e-02	-0.3	14164
128	2.6989135e-01	1.0422074e+00	2.70e-01	4.261e-03	0.0	14131
129	2.6969341e-01	2.0589053e-01	2.70e-01	2.060e-03	0.0	14119
130	2.6949855e-01	1.7848726e-01	2.69e-01	1.987e-03	0.0	14109
131	2.6796305e-01	4.3156505e-01	2.68e-01	2.762e-03	0.0	13790
132	2.6759501e-01	3.9271022e-01	2.68e-01	2.469e-03	-0.3	13745
133	2.6761095e-01	1.3860771e+00	2.68e-01	5.328e-03	0.0	13718
134	2.6725253e-01	3.1732507e-01	2.67e-01	2.331e-03	0.0	13681
135	2.6716498e-01	2.3731397e-01	2.67e-01	2.163e-03	0.0	13670
136	2.6707764e-01	1.7494186e-01	2.67e-01	1.993e-03	0.0	13653
137	2.6649206e-01	1.9708421e+00	2.66e-01	6.739e-03	0.0	13479
138	2.6647283e-01	1.2781645e+00	2.66e-01	4.860e-03	-0.3	13462
139	2.6625940e-01	4.8312457e-01	2.66e-01	2.801e-03	0.0	13457
140	2.6621811e-01	1.1945630e-01	2.66e-01	1.848e-03	0.0	13448
141	2.6612199e-01	2.1515463e-01	2.66e-01	2.099e-03	0.0	13420
142	2.6573068e-01	2.7778866e+00	2.66e-01	8.828e-03	-0.3	13227
143	2.6556590e-01	8.8240953e-01	2.66e-01	3.860e-03	-0.3	13211
144	2.6531995e-01	1.1351017e-01	2.65e-01	1.836e-03	0.0	13205
145	2.6528152e-01	1.1274251e-01	2.65e-01	1.834e-03	0.0	13200
146	2.6510382e-01	3.8349177e-01	2.65e-01	2.542e-03	0.0	13144
147	2.6504718e-01	2.9656487e-01	2.65e-01	2.315e-03	-0.3	13116
148	2.6503466e-01	2.1647890e+00	2.65e-01	7.215e-03	0.0	13084
149	2.2655981e-01	2.5979515e+00	2.27e-01	7.335e-03	0.0	13567
150	2.2229052e-01	4.3800521e+00	2.22e-01	1.209e-02	0.0	13647
151	2.2113083e-01	4.4490317e+00	2.21e-01	1.213e-02	0.0	13700
152	2.1981033e-01	1.9312130e+00	2.20e-01	5.746e-03	0.0	13715
153	2.1939928e-01	2.2168463e-01	2.19e-01	1.372e-03	0.0	13732
154	2.1906104e-01	3.6032827e-01	2.19e-01	1.730e-03	0.0	13747
155	2.1836676e-01	2.5240653e+00	2.18e-01	7.317e-03	0.0	13827
156	2.1804624e-01	5.1065569e-01	2.18e-01	2.148e-03	-0.3	13821
157	2.1788637e-01	1.2034637e-01	2.18e-01	1.141e-03	0.0	13832
158	2.1775006e-01	2.1563716e-01	2.18e-01	1.378e-03	0.0	13839
159	2.1748771e-01	2.7773857e+00	2.17e-01	7.947e-03	0.0	13909
160	2.1751667e-01	2.9550700e+00	2.18e-01	8.397e-03	-0.3	13903
161	2.1704230e-01	1.6904628e-01	2.17e-01	1.264e-03	0.0	13901
162	2.1701522e-01	9.3389067e-02	2.17e-01	1.071e-03	0.0	13901
163	2.1690480e-01	1.7429216e-01	2.17e-01	1.279e-03	0.0	13901
164	2.1674921e-01	3.0228868e+00	2.17e-01	8.576e-03	0.0	13858
165	2.1669511e-01	2.5115381e+00	2.17e-01	7.277e-03	-0.3	13852
166	2.1630334e-01	2.2121860e-01	2.16e-01	1.407e-03	0.0	13848
167	2.1627979e-01	7.2396982e-02	2.16e-01	1.025e-03	0.0	13845
168	2.1623293e-01	1.1076599e-01	2.16e-01	1.121e-03	0.0	13846
169	2.1602701e-01	4.1860365e-01	2.16e-01	1.910e-03	0.0	13780
170	2.1602529e-01	1.2947002e+00	2.16e-01	4.141e-03	-0.3	13760
171	1.9712909e-01	2.5260347e+00	1.97e-01	6.358e-03	0.0	14169
172	1.9495228e-01	4.1640198e+00	1.95e-01	1.068e-02	0.0	14213
173	1.9270710e-01	2.3908621e+00	1.93e-01	6.114e-03	0.0	14245
174	1.9196774e-01	4.0991984e-01	1.92e-01	1.214e-03	0.0	14269

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  175  1.9174378e-01  1.0260535e-01   1.92e-01  4.446e-04     0.0   14281
  176  1.9114373e-01  5.5912208e-01   1.91e-01  1.575e-03     0.0   14356
  177  1.9124803e-01  2.9387614e+00   1.91e-01  7.453e-03    -0.3   14411
  178  1.9086004e-01  1.0398648e+00   1.91e-01  2.751e-03    -0.3   14418
  179  1.9078164e-01  7.6646912e-02   1.91e-01  3.533e-04     0.0   14426
  180  1.9074869e-01  5.2411840e-02   1.91e-01  2.922e-04     0.0   14436
  181  1.9045752e-01  5.3472177e-01   1.90e-01  1.497e-03     0.0   14515
  182  1.9057198e-01  2.1231379e+00   1.91e-01  5.409e-03    -0.3   14530
  183  1.9044941e-01  1.4629878e+00   1.90e-01  3.788e-03     0.0   14528
  184  1.9036215e-01  5.8548453e-02   1.90e-01  2.927e-04     0.0   14530
  185  1.9035260e-01  3.6826384e-02   1.90e-01  2.381e-04     0.0   14533
  186  1.9027156e-01  6.3199937e-02   1.90e-01  3.032e-04     0.0   14570
  187  1.9024462e-01  3.2823096e-01   1.90e-01  9.531e-04    -0.3   14612
  188  1.9028801e-01  1.0775221e+00   1.90e-01  2.819e-03    -0.3   14625
  189  1.9022259e-01  8.2066328e-01   1.90e-01  2.184e-03     0.0   14633
  190  1.9018764e-01  5.4888245e-02   1.90e-01  2.771e-04     0.0   14638
  191  1.9018243e-01  3.2626351e-02   1.90e-01  2.206e-04     0.0   14642
  192  1.8943385e-01  2.2306995e-01   1.89e-01  3.905e-04    -0.3   14804
  193  1.8937237e-01  4.1850943e-01   1.89e-01  7.794e-04     0.0   14833
  194  1.8923419e-01  3.0869878e-01   1.89e-01  5.441e-04     0.0   14868
  195  1.8917898e-01  4.6971249e-02   1.89e-01  9.067e-05     0.0   14874
  196  1.8917066e-01  3.1666987e-02   1.89e-01  6.165e-05     0.0   14877
  197  1.8915894e-01  3.8142334e-02   1.89e-01  3.493e-05     0.0   14893
  198  1.8915590e-01  1.6883762e-01   1.89e-01  1.467e-04     0.0   14915
  199  1.8915742e-01  2.5887572e-01   1.89e-01  1.869e-04    -0.3   14913
  200  1.8915339e-01  1.6581355e-03   1.89e-01  1.230e-06     0.0   14914

 ERROR EXIT -- Too many iterations

 Products with A     :     267        Total time   (secs) :    25.9
 Products with A'    :     201        Project time (secs) :     1.9
 Newton iterations   :      11        Mat-vec time (secs) :    22.0
 Line search its     :     103        Subspace iterations :       0


 ================================================================================
 PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :    12800      No. columns           :    73051
 Initial tau           : 0.00e+00      Two-norm of b         : 9.73e+00
 Optimality tol        : 1.00e-04      Target objective      : 0.00e+00
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

     0  9.7323992e+00  0.0000000e+00   1.00e+00  1.228e+00     0.0       0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          1           4     5.00000e-01     7.66006e+00     1.088
         2          1          10     1.00000e+00     5.30213e+00     6.308
         3          1          17     1.00000e+00     5.04044e+00     1.117
         4          1          24     1.00000e+00     5.03215e+00     5.973
         5          1          32     1.00000e+00     5.02680e+00     5.775
         6          1          46     1.00000e+00     5.02017e+00     5.828
         7          1          64     1.00000e+00     5.01293e+00     4.895
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         8          1          79     1.00000e+00     5.00747e+00     3.639
         9          1         102     1.00000e+00     5.00343e+00     3.180
        10          1         116     1.00000e+00     4.99972e+00     2.885
        11          1         128     1.00000e+00     4.99717e+00     2.509
        12          1         140     1.00000e+00     4.99514e+00     2.163
break of testUpdateTau    12  4.9951352e+00  1.3723621e-01   1.00e+00  2.6

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        13          1           4     1.00000e+00     4.22071e+00     2.216
        14          1          12     1.00000e+00     2.64115e+00     4.886
        15          1          19     1.00000e+00     2.57652e+00     2.953
        16          1          26     1.00000e+00     2.53493e+00     1.896
        17          1          36     1.00000e+00     2.51058e+00     1.418
        18          1          47     1.00000e+00     2.49287e+00     1.014
        19          1          59     1.00000e+00     2.48177e+00     7.304
        20          1          72     1.00000e+00     2.47401e+00     5.885
        21          1          86     1.00000e+00     2.46858e+00     5.147
        22          1         100     1.00000e+00     2.46464e+00     4.383
        23          1         113     1.00000e+00     2.46133e+00     3.843
        24          1         127     1.00000e+00     2.45869e+00     3.171
        25          1         151     1.00000e+00     2.45692e+00     2.846
        26          1         173     1.00000e+00     2.45565e+00     2.432
        27          1         188     1.00000e+00     2.45466e+00     1.939
break of testUpdateTau    27  2.4546648e+00  2.1536908e-01   1.00e+00  3.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        28          1           4     1.00000e+00     1.47423e+00     1.875
        29          1          11     1.00000e+00     1.01692e+00     7.268
        30          1          18     1.00000e+00     9.32699e-01     4.264
        31          1          26     1.00000e+00     8.67793e-01     2.637
        32          1          36     1.00000e+00     8.34318e-01     1.884
        33          1          48     1.00000e+00     8.14221e-01     1.447
        34          1          59     1.00000e+00     8.02255e-01     1.199
        35          1          72     1.00000e+00     7.89013e-01     1.010
        36          1          86     1.00000e+00     7.78250e-01     8.515
        37          1         101     1.00000e+00     7.70715e-01     7.361
        38          1         119     1.00000e+00     7.64709e-01     6.512
        39          1         133     1.00000e+00     7.59538e-01     5.842
        40          1         149     1.00000e+00     7.55158e-01     5.267
        41          1         158     1.00000e+00     7.52419e-01     4.907
        42          1         177     1.00000e+00     7.49323e-01     4.436
        43          1         195     1.00000e+00     7.46520e-01     4.048
        44          1         215     1.00000e+00     7.43949e-01     3.644
        45          1         230     1.00000e+00     7.41805e-01     3.350
        46          1         244     1.00000e+00     7.39912e-01     3.120
        47          1         263     1.00000e+00     7.38248e-01     2.917
        48          1         278     1.00000e+00     7.36820e-01     2.657
        49          1         299     1.00000e+00     7.35513e-01     2.404
        50          1         316     1.00000e+00     7.34288e-01     2.392
        51          1         336     1.00000e+00     7.33306e-01     2.300
        52          1         352     1.00000e+00     7.32286e-01     2.094
        53          1         370     1.00000e+00     7.31343e-01     1.932
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          54           1         379     1.00000e+00     7.30891e-01     1.915
          55           1         401     1.00000e+00     7.30265e-01     1.905
          56           1         416     1.00000e+00     7.29622e-01     1.830
          57           1         436     1.00000e+00     7.28898e-01     1.611
          58           1         461     1.00000e+00     7.28254e-01     1.524
          59           1         486     1.00000e+00     7.27744e-01     1.495
          60           1         507     1.00000e+00     7.27231e-01     1.445
          61           1         524     1.00000e+00     7.26746e-01     1.407
          62           1         544     1.00000e+00     7.26276e-01     1.327
          63           1         565     1.00000e+00     7.25885e-01     1.198
          64           1         587     1.00000e+00     7.25493e-01     1.168
          65           1         609     1.00000e+00     7.25143e-01     1.154
break of testUpdateTau    65  7.2514288e-01  2.2692667e-01   7.25e-01  7.3

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
          66           1           4     1.00000e+00     4.22033e-01     8.431
          67           1          10     1.00000e+00     2.94999e-01     3.278
          68           1          17     1.00000e+00     2.67116e-01     1.822
          69           1          26     1.00000e+00     2.45941e-01     1.024
          70           1          34     1.00000e+00     2.36552e-01     7.341
          71           1          46     1.00000e+00     2.31660e-01     5.697
          72           1          56     1.00000e+00     2.28702e-01     4.961
          73           1          69     1.00000e+00     2.24519e-01     3.822
          74           1          82     1.00000e+00     2.21123e-01     3.133
          75           1         101     1.00000e+00     2.18896e-01     2.810
          76           1         116     1.00000e+00     2.17342e-01     2.569
          77           1         128     1.00000e+00     2.15781e-01     2.335
          78           1         143     1.00000e+00     2.14377e-01     2.101
          79           1         155     1.00000e+00     2.13181e-01     1.873
          80           1         172     1.00000e+00     2.12183e-01     1.677
          81           1         193     1.00000e+00     2.11251e-01     1.517
          82           1         215     1.00000e+00     2.10380e-01     1.424
          83           1         232     1.00000e+00     2.09625e-01     1.352
          84           1         256     1.00000e+00     2.08988e-01     1.268
          85           1         275     1.00000e+00     2.08405e-01     1.200
          86           1         291     1.00000e+00     2.07911e-01     1.128
          87           1         312     1.00000e+00     2.07422e-01     1.071
          88           1         338     1.00000e+00     2.06978e-01     1.011
          89           1         360     1.00000e+00     2.06564e-01     9.548
          90           1         387     1.00000e+00     2.06190e-01     9.053
          91           1         408     1.00000e+00     2.05856e-01     8.535
          92           1         435     1.00000e+00     2.05531e-01     8.274
          93           1         444     1.00000e+00     2.05368e-01     7.924
          94           1         469     1.00000e+00     2.05096e-01     7.794
          95           1         496     1.00000e+00     2.04822e-01     7.599
          96           1         526     1.00000e+00     2.04558e-01     7.044
          97           1         551     1.00000e+00     2.04302e-01     6.891
          98           1         570     1.00000e+00     2.04077e-01     6.739
          99           1         585     1.00000e+00     2.03853e-01     6.597
         100           1         602     1.00000e+00     2.03644e-01     6.199
         101           1         623     1.00000e+00     2.03434e-01     5.849
         102           1         649     1.00000e+00     2.03243e-01     5.818
         103           1         671     1.00000e+00     2.03073e-01     5.643
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       104          1        696     1.00000e+00     2.02902e-01     5.384
       105          1        728     1.00000e+00     2.02737e-01     5.278
       106          1        752     1.00000e+00     2.02574e-01     5.308
       107          1        780     1.00000e+00     2.02427e-01     5.226
       108          1        806     1.00000e+00     2.02275e-01     5.016
       109          1        830     1.00000e+00     2.02136e-01     4.861
       110          1        858     1.00000e+00     2.02002e-01     4.726
       111          1        885     1.00000e+00     2.01884e-01     4.464
       112          1        910     1.00000e+00     2.01758e-01     4.390
       113          1        940     1.00000e+00     2.01649e-01     4.372
       114          1        971     1.00000e+00     2.01545e-01     4.412
       115          1       1008     1.00000e+00     2.01449e-01     4.313
break of testUpdateTau   115  2.0144940e-01  1.3376296e-01   2.01e-01  9.0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       116          1          4     5.00000e-01     1.93181e-01     1.351
       117          1         12     1.00000e+00     1.90205e-01     5.820
       118          1         21     1.00000e+00     1.89582e-01     3.056
       119          1         31     1.00000e+00     1.89220e-01     1.490
       120          1         43     1.00000e+00     1.89178e-01     9.939
break of testUpdateTau   120  1.8917771e-01  1.6219737e-01   1.89e-01  3.7

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       121          1          4     2.50000e-01     1.89162e-01     5.529
break of testUpdateTau   121  1.8916245e-01  1.4425829e-01   1.89e-01  2.6

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       122          1          4     2.50000e-01     1.89158e-01     3.647
break of testUpdateTau   122  1.8915761e-01  1.3167929e-01   1.89e-01  1.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       123          1          4     2.50000e-01     1.89156e-01     2.540
break of testUpdateTau   123  1.8915555e-01  1.2300630e-01   1.89e-01  1.4

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       124          1          4     2.50000e-01     1.89155e-01     1.823
break of testUpdateTau   124  1.8915455e-01  1.1832610e-01   1.89e-01  1.0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       125          1          4     2.50000e-01     1.89154e-01     1.333
break of testUpdateTau   125  1.8915403e-01  1.1409543e-01   1.89e-01  7.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       126          1          4     2.50000e-01     1.89154e-01     9.852
break of testUpdateTau   126  1.8915374e-01  1.1231685e-01   1.89e-01  5.9

Inside of minConf_PQN
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 Iteration   FunEvals Projections     Step Length          rNorm2        O
       127          1           4     2.50000e-01     1.89154e-01     7.330
break of testUpdateTau   127  1.8915359e-01  1.1026971e-01   1.89e-01  4.4

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       128          1           4     2.50000e-01     1.89153e-01     5.474
break of testUpdateTau   128  1.8915350e-01  1.0960677e-01   1.89e-01  3.3

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       129          1           4     2.50000e-01     1.89153e-01     4.094
break of testUpdateTau   129  1.8915345e-01  1.0895197e-01   1.89e-01  2.5

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       130          1           4     2.50000e-01     1.89153e-01     3.068
break of testUpdateTau   130  1.8915342e-01  1.0870439e-01   1.89e-01  1.8

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       131          1           4     2.50000e-01     1.89153e-01     2.298
break of testUpdateTau   131  1.8915341e-01  1.0833769e-01   1.89e-01  1.4

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       132          1           4     2.50000e-01     1.89153e-01     1.724
break of testUpdateTau   132  1.8915340e-01  1.0813767e-01   1.89e-01  1.0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       133          1           4     2.50000e-01     1.89153e-01     1.292
break of testUpdateTau   133  1.8915339e-01  1.0795173e-01   1.89e-01  7.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       134          1           4     2.50000e-01     1.89153e-01     9.695
break of testUpdateTau   134  1.8915339e-01  1.0779049e-01   1.89e-01  5.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       135          1           4     2.50000e-01     1.89153e-01     7.268
break of testUpdateTau   135  1.8915339e-01  1.0771652e-01   1.89e-01  4.4

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       136          1           4     2.50000e-01     1.89153e-01     5.453
break of testUpdateTau   136  1.8915339e-01  1.0758277e-01   1.89e-01  3.3

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       137          1           4     2.50000e-01     1.89153e-01     4.088
break of testUpdateTau   137  1.8915339e-01  1.0757614e-01   1.89e-01  2.5
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Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       138          1           4     2.50000e-01     1.89153e-01     3.067
break of testUpdateTau   138  1.8915339e-01  1.0746045e-01   1.89e-01  1.8

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       139          1           4     2.50000e-01     1.89153e-01     2.299
break of testUpdateTau   139  1.8915339e-01  1.0749357e-01   1.89e-01  1.4

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       140          1           4     2.50000e-01     1.89153e-01     1.725
break of testUpdateTau   140  1.8915339e-01  1.0738922e-01   1.89e-01  1.0

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       141          1           4     2.50000e-01     1.89153e-01     1.293
break of testUpdateTau   141  1.8915339e-01  1.0744552e-01   1.89e-01  7.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       142          1           4     2.50000e-01     1.89153e-01     9.706
break of testUpdateTau   142  1.8915339e-01  1.0734808e-01   1.89e-01  5.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       143          1           4     2.50000e-01     1.89153e-01     7.276
break of testUpdateTau   143  1.8915339e-01  1.0741779e-01   1.89e-01  4.4

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       144          1           4     2.50000e-01     1.89153e-01     5.459
break of testUpdateTau   144  1.8915339e-01  1.0732447e-01   1.89e-01  3.3

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       145          1           4     2.50000e-01     1.89153e-01     4.093
break of testUpdateTau   145  1.8915339e-01  1.0740187e-01   1.89e-01  2.5

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       146          1           4     2.50000e-01     1.89153e-01     3.071
break of testUpdateTau   146  1.8915339e-01  1.0731097e-01   1.89e-01  1.8

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       147          1           4     2.50000e-01     1.89153e-01     2.302
break of testUpdateTau   147  1.8915339e-01  1.0739277e-01   1.89e-01  1.4

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       148          1           4     2.50000e-01     1.89153e-01     1.727
break of testUpdateTau   148  1.8915339e-01  1.0730329e-01   1.89e-01  1.0
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Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       149          1           4     2.50000e-01     1.89153e-01     1.295
break of testUpdateTau   149  1.8915339e-01  1.0738759e-01   1.89e-01  7.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
       150          1           4     2.50000e-01     1.89153e-01     9.717
break of testUpdateTau   150  1.8915339e-01  1.0729892e-01   1.89e-01  5.9

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   151  1.8915339e-01  1.4307793e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   152  1.8915339e-01  1.7885693e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   153  1.8915339e-01  2.1463593e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   154  1.8915339e-01  2.5041494e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   155  1.8915339e-01  2.8619394e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   156  1.8915339e-01  3.2197295e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   157  1.8915339e-01  3.5775195e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   158  1.8915339e-01  3.9353095e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
```

```
   159  1.8915339e-01  4.2930996e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   160  1.8915339e-01  4.6508896e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   161  1.8915339e-01  5.0086796e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   162  1.8915339e-01  5.3664697e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   163  1.8915339e-01  5.7242597e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   164  1.8915339e-01  6.0820497e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   165  1.8915339e-01  6.4398398e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   166  1.8915339e-01  6.7976298e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   167  1.8915339e-01  7.1554199e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   168  1.8915339e-01  7.5132099e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   169  1.8915339e-01  7.8709999e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
```

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Directional Derivative below optTol
   170  1.8915339e-01  8.2287900e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   171  1.8915339e-01  8.5865800e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   172  1.8915339e-01  8.9443700e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   173  1.8915339e-01  9.3021601e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   174  1.8915339e-01  9.6599501e-01   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   175  1.8915339e-01  1.0017740e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   176  1.8915339e-01  1.0375530e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   177  1.8915339e-01  1.0733320e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   178  1.8915339e-01  1.1091110e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   179  1.8915339e-01  1.1448900e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   180  1.8915339e-01  1.1806690e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
```

```
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   181  1.8915339e-01  1.2164480e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   182  1.8915339e-01  1.2522270e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   183  1.8915339e-01  1.2880060e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   184  1.8915339e-01  1.3237850e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   185  1.8915339e-01  1.3595641e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   186  1.8915339e-01  1.3953431e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   187  1.8915339e-01  1.4311221e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   188  1.8915339e-01  1.4669011e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   189  1.8915339e-01  1.5026801e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   190  1.8915339e-01  1.5384591e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   191  1.8915339e-01  1.5742381e+00   1.89e-01  5.950e-08     0.0   13633
```

```
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   192  1.8915339e-01  1.6100171e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   193  1.8915339e-01  1.6457961e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   194  1.8915339e-01  1.6815751e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   195  1.8915339e-01  1.7173541e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   196  1.8915339e-01  1.7531331e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   197  1.8915339e-01  1.7889121e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   198  1.8915339e-01  1.8246911e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   199  1.8915339e-01  1.8604701e+00   1.89e-01  5.950e-08     0.0   13633

Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
Directional Derivative below optTol
   200  1.8915339e-01  1.8962491e+00   1.89e-01  5.950e-08     0.0   13633

 ERROR EXIT -- Too many iterations

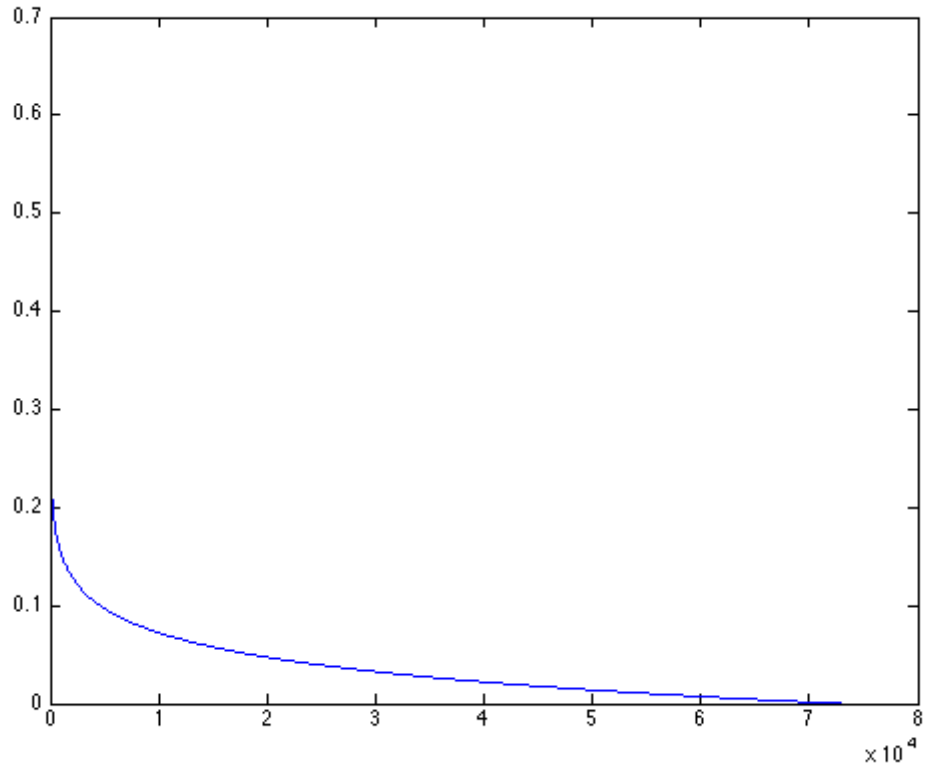
 Products with A     :     298        Total time   (secs) :   198.5
 Products with A'    :     298        Project time (secs) :   144.6
 Newton iterations   :      86        Mat-vec time (secs) :    37.5

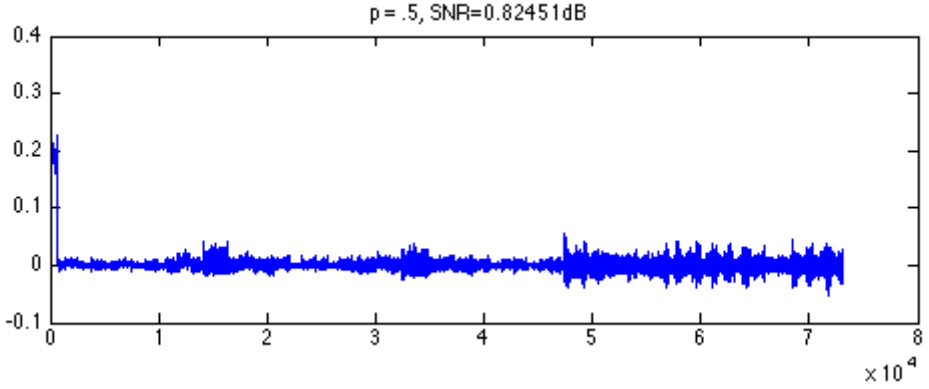

info_spg =
```

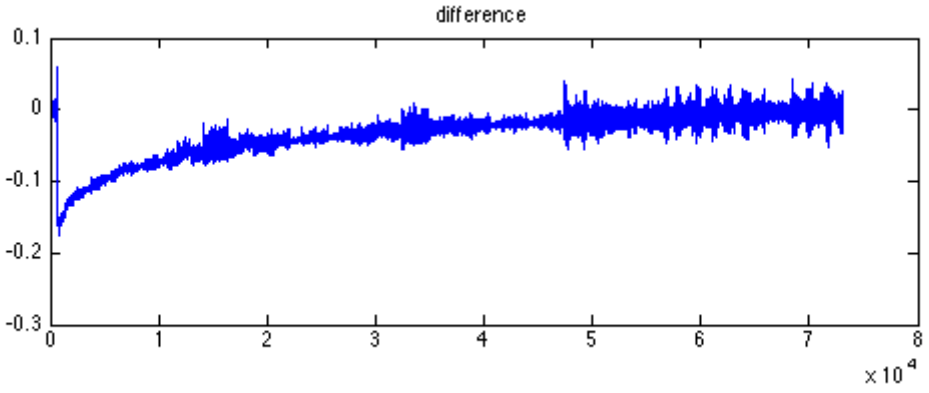
```
              tau: 3.0485e+04
            rNorm: 0.1892
             rGap: 0.0017
            gNorm: 1.2297e-06
             stat: 5
             iter: 200
           nProdA: 267
          nProdAt: 201
          nNewton: 11
      timeProject: 1.8775
      timeMatProd: 22.0457
          itnLSQR: 0
          options: [1x1 struct]
        timeTotal: 25.8903
            xNorm1: [200x1 double]
            rNorm2: [200x1 double]
            lambda: [200x1 double]

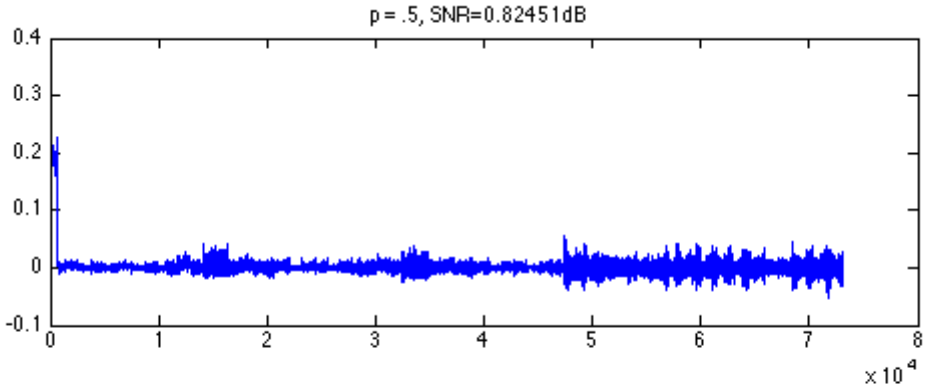

info_pqn1 =

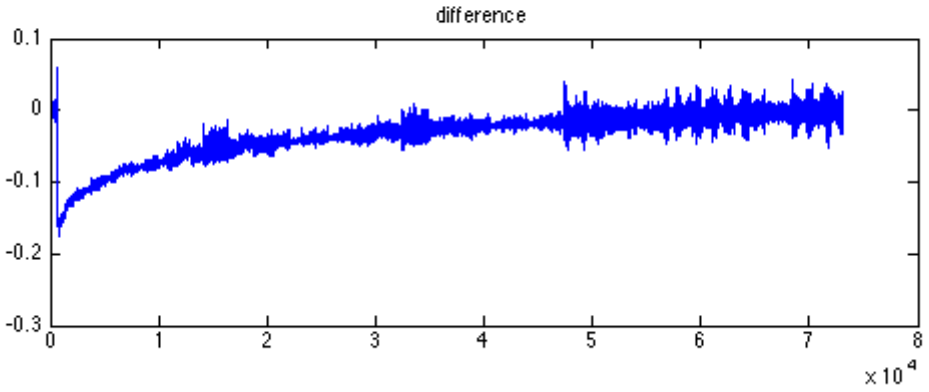
              tau: 3.2472e+07
            rNorm: 0.1892
             rGap: 1.8962
            gNorm: 5.9499e-08
             stat: 5
             iter: 200
           nProdA: 298
          nProdAt: 298
          nNewton: 86
      timeProject: 144.5731
      timeMatProd: 37.4528
          itnLSQR: 0
          options: [1x1 struct]
        timeTotal: 198.5145
            xNorm1: [200x1 double]
            rNorm2: [200x1 double]
            lambda: [200x1 double]
```

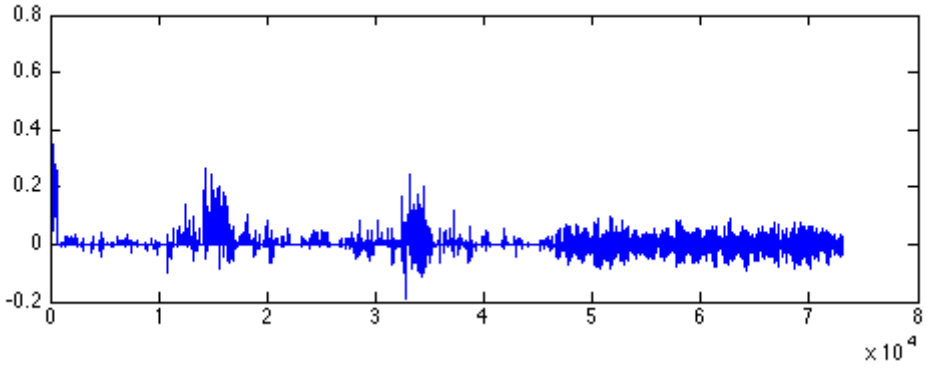

0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8
x 10^4

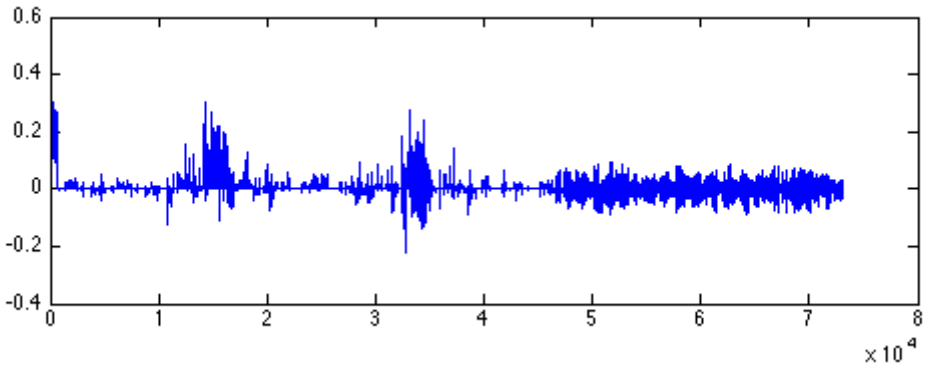

p = .5, SNR=0.82451dB
0.4
0.3
0.2
0.1
0
-0.1
0 1 2 3 4 5 6 7 8
x 10^4

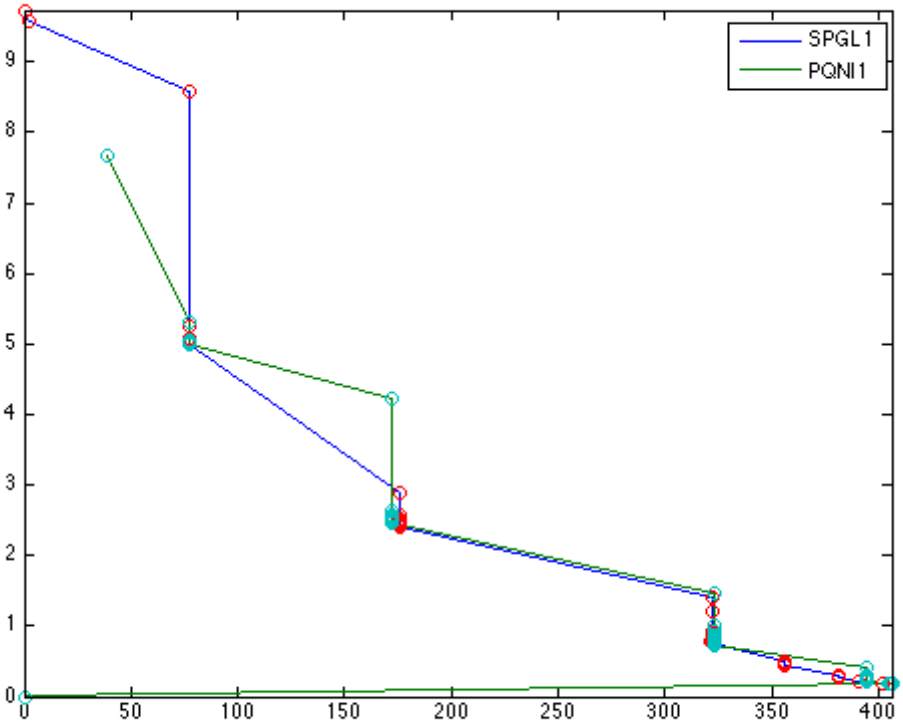

difference
0.1
0
-0.1
-0.2
-0.3
0 1 2 3 4 5 6 7 8
x 10^4


p = .5, SNR=0.82451dB
0.4
0.3
0.2
0.1
0
-0.1
0 1 2 3 4 5 6 7 8
x 10^4


difference
0.1
0
-0.1
-0.2
-0.3
0 1 2 3 4 5 6 7 8
x 10^4


0.8
0.6
0.4
0.2
0
-0.2
0 1 2 3 4 5 6 7 8
x 10^4


0.6
0.4
0.2
0
-0.2
-0.4
0 1 2 3 4 5 6 7 8
x 10^4



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