

EKT 720 Assignment 3

- a) The estimated regression line is:
 $Prop = 106.85085 + 0.7971 \text{ Income} + 0.4945 \text{ Stand} + 139.9591 \text{ Ratio} + 133.0302 \text{ Double}$
- b) The results in the program show the estimation of the parameters of the model based on the leave one out approach. To test the estimated parameters, the estimated regression equation can be used to calculate the observation that is left one to test the significance of the line in estimation. The results in the program estimates the model n times, leaving one observation each time. The results are in the form of a table where each column represents a parameter in the model, starting with β_1 and ending with β_5 .
- c) Using the results in 'b', the average of the results is given in this section. The value of the averages of the individual parameters are very close to those estimated in the initial estimated regression line given in 'a'. This means that on average, the estimated regression line is given by:
 $Prop = 106.4981 + 0.79732 \text{ Income} + 0.49549 \text{ Stand} + 140.2023 \text{ Ratio} + 133.05019 \text{ Double}$
- d) As shown in the results of the program, on average the estimated regression line is given by:
 $Prop = 108.0474 + 0.8098 \text{ Income} + 0.4938 \text{ Stand} + 132.9033 \text{ Ratio} + 130.5417 \text{ Double}$
- e) As shown in the results of the program, on average the estimated regression line is given by:
 $Prop = 93.8343 + 0.8117 \text{ Income} + 0.49703 \text{ Stand} + 145.0029 \text{ Ratio} + 135.39209 \text{ Double}$

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**Assignment 3 coding**;  
proc iml;  
  use a;  
  read all into c;  
  n=nrow(c);  
  y=c[,6];  
  income=c[,1]+c[,2];  
  house=c[,3];  
  stand=c[,4];  
  double=c[,5];  
  ratio=house/stand;  
  x=j(n,1,1)||income||stand||ratio||double;  
  yx=y||x[,2:5];  
  
  print '3a';  
  bhat=inv(x`*x)*x`*y;  
  print bhat;  
  
  result=j(n,5,.);  
  
  print '3b';  
  m=y||x[,2:5];  
  do i=1 to n;  
    if i=1 then lout=m[2:n,]; /*if removing the first obs*/  
    else if i=n then lout=m[1:n-1,]; /*if removing the last obs*/  
    else lout=m[1:i-1,]//m[i+1:n,]; /*if removing obs in between, concatenate vertically*/  
  
    y_rem=lout[,1];  
    x_rem=j(n-1,1,1)||lout[,2:5];  
    bhat_rem=inv(x_rem`*x_rem)*x_rem`*y_rem;  
    **print bhat_rem;  
  
    result[i,]=bhat_rem`;  
  end;  
  print result;  
  
  print '3c';  
  aresult=result[:,]; /*average*/  
  print aresult;  
  
  print '3d';  
  result_d=j(n,5,.);  
  **u=sample(1:30,30);  
  **s=x[u];  
  do i=1 to n;  
    b=j(n,1,0);  
    draw=int(uniform(b)*n)+1;  
    sample=m[draw,];  
    **print draw sample;  
    x_sam=j(n,1,1)||sample[,2:5];  
    y_sam=sample[,1];  
    bhat_d=inv(x_sam`*x_sam)*x_sam`*y_sam;  
    result_d[i,]=bhat_d`;  
  end;  
  print result_d;  
  
  print '3d average';  
  aresult_d=result_d[:,];  
  print aresult_d;
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print '3e';
result_e=j(100,5,.);

do i=1 to 100;
  b1=j(n,1,0);
  draw1=int(uniform(b1)*n)+1;
  sample1=m[draw1,];

  **print draw sample;
  xe_sam=j(n,1,1)||sample1[,2:5];
  ye_sam=sample1[,1];
  bhat_e=inv(xe_sam`*xe_sam)*xe_sam`*ye_sam;
  result_e[i,]=bhat_e`;
end;
print result_e;

print '3e average';
aresult_e=result_e[:];
print aresult_e;
```

3a

bhat

106.85085

0.7970982

0.4954084

139.95912

133.03019

3b

result

127.70109	0.7852868	0.4889042	121.1254	134.82822
105.13005	0.7976525	0.4964962	140.26458	133.44209
109.86095	0.7955925	0.492758	139.71557	129.57704
91.215882	0.8168917	0.4879476	159.39092	144.97683
104.56749	0.7863398	0.4969371	148.01829	134.27254
65.730456	0.8101562	0.519125	165.86762	118.55801
110.17841	0.7941665	0.4941684	137.98904	133.33092
105.76806	0.7945086	0.4960053	142.76673	133.13812
105.60718	0.8007671	0.4961701	137.40567	133.50628
79.013358	0.7983528	0.5177756	160.00848	130.21487
143.84255	0.7742924	0.4891075	112.65597	129.19128
114.67298	0.7976942	0.4917042	132.39265	132.56561
107.43153	0.8162341	0.486159	131.09629	135.94782
107.86645	0.8017534	0.4983826	132.45259	132.16017
106.99173	0.7970072	0.4953556	139.8706	133.08821
107.39437	0.7940505	0.5018392	134.63326	132.30435
107.23878	0.7959601	0.4951851	140.79747	132.84107
104.61928	0.7901064	0.4938937	149.97023	133.53692
113.32885	0.7956668	0.4898356	139.42308	131.9269
92.173328	0.8004039	0.5051155	152.48566	130.65843
125.45941	0.7768477	0.497813	127.40919	130.26905

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result

102.59881	0.8037391	0.4988612	135.92692	133.90561
100.89459	0.8063927	0.4995816	136.69164	137.3621
104.80612	0.7948083	0.4970755	143.00666	134.20388
123.56676	0.7695618	0.5012178	122.82433	135.92795
108.45917	0.7962002	0.4925795	142.4837	132.47396
94.302292	0.8404831	0.4716231	149.85384	136.83839
109.1384	0.7947174	0.4909835	145.2388	132.02484
110.2418	0.7891373	0.4988103	135.09322	133.91208
105.14397	0.8049574	0.4833223	149.21059	134.52228

3c

areult

106.49814	0.7973243	0.4954911	140.2023	133.05019
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3d

result_d

80.907535	0.8363571	0.4679907	190.13915	122.12178
125.13371	0.7575384	0.5021936	132.14196	130.95429
134.32115	0.7548375	0.5207092	119.46246	105.60225
132.55763	0.8193451	0.4972353	98.553998	151.73421
14.153839	0.7166868	0.5389992	321.46768	148.83876
288.89153	0.6814583	0.4651564	-6.757442	124.14352
111.64554	0.7608951	0.5150508	128.62296	121.3116
79.161501	0.787524	0.5368697	136.67162	138.21728
41.853882	0.8364468	0.4981717	200.10375	128.72385
204.80352	0.7603286	0.4484876	79.438834	136.18266
94.163938	0.7905157	0.4926347	178.93199	139.48363
1.5905722	0.8244054	0.5431866	223.98203	141.32887
204.08212	0.8317196	0.4227393	56.591673	125.97778
55.519545	0.8252517	0.471459	249.76713	121.99818
151.11312	0.7359939	0.5128983	98.492924	137.9064

result_d

234.75351	0.7799495	0.4206305	49.843754	105.79417
239.689	0.702292	0.4547028	64.786778	133.15357
127.95148	0.7582647	0.4979032	146.02265	102.23659
107.19398	0.8498093	0.455899	138.20885	133.4848
26.002592	0.8512551	0.5063609	204.83687	115.25485
167.79397	0.7521638	0.4884439	83.785431	127.35234
-13.25141	0.9437224	0.4760367	212.76815	126.72793
95.270609	0.8004778	0.4975552	138.7042	144.16044
76.880152	0.8574129	0.4462915	188.40899	163.30852
-82.10451	0.8587761	0.6004626	270.98194	140.1592
-108.2545	0.8942939	0.5932112	294.85515	95.611283
2.889172	0.8392834	0.5733343	161.40902	122.78122
142.06678	0.8060484	0.4203978	180.19115	130.78568
81.972873	0.8438171	0.4263243	241.43832	142.19408
15.126213	1.0287043	0.3564895	247.01019	176.1068

3d average

areult_d

94.462636	0.8095192	0.4882608	161.02874	131.12122
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3e

result_e

184.53882	0.8230227	0.4152801	82.21662	96.124357
45.43135	0.7900885	0.5598803	183.32153	124.32456
116.60377	0.6941588	0.5667707	132.01831	128.03151
72.869878	0.8721153	0.4426375	199.94234	140.32042
73.669596	0.9646794	0.4610754	79.060784	184.41783
152.24464	0.7235	0.5186546	104.8836	153.50064
81.622041	0.7887349	0.5162056	166.90325	137.10238
97.512291	0.8113705	0.5355313	101.09905	134.11893
88.836789	0.8182422	0.5152652	125.40773	126.03326

result_e				
83.578421	0.8163129	0.4841539	166.61941	133.91166
234.40082	0.7748682	0.4618513	2.1836095	115.1286
54.490161	0.8413036	0.5194492	170.30484	117.23396
7.8209379	0.7701955	0.6259587	181.17202	86.287981
87.019703	0.8789191	0.3962178	199.38327	152.13135
48.604332	0.7834886	0.5490678	184.80486	113.2458
32.838659	0.9424078	0.4545496	170.93841	164.22339
97.877453	0.849642	0.477061	126.49419	165.09806
189.54811	0.7912063	0.4737438	37.039518	139.27651
118.13694	0.8784303	0.4288393	135.107	144.91233
107.06521	0.7374553	0.5378704	158.73444	99.200352
121.66804	0.7610965	0.4975086	145.59873	109.81538
46.038234	0.7730122	0.5418614	198.55485	132.46642
62.816824	0.7685096	0.5540043	175.75621	105.87575
74.10451	0.8169783	0.5289813	146.02011	130.43542
101.78171	0.794524	0.5194157	107.87127	119.37284
156.72359	0.7949022	0.4780927	75.510006	153.1856
-3.143786	0.9795833	0.4050988	254.27095	161.75864
175.20628	0.7160164	0.4980075	96.729802	133.05692
89.880889	0.7908731	0.4888195	162.01028	146.55244
-12.93745	0.8412112	0.5345437	241.10246	147.02507
-5.926474	0.8885893	0.5431521	194.3386	141.56618
150.03889	0.7794596	0.4646296	121.25621	138.87202
47.218057	0.794731	0.5116662	185.80523	156.46873
18.716209	0.8396986	0.550843	176.56213	135.66811
121.0564	0.8541973	0.443307	141.39846	133.02177
127.02946	0.7991905	0.4796509	131.24736	138.25997
90.230197	0.7705075	0.4897264	182.07816	124.77919
80.526054	0.7168381	0.5500388	172.59294	135.5295
167.39722	0.7360619	0.4957977	81.813214	135.48925
77.877997	0.8776737	0.4593458	160.65468	155.89376

result_e				
66.784735	0.9414121	0.4371471	149.33144	168.54986
27.262483	0.8618445	0.472669	243.4492	162.92323
155.71611	0.7913336	0.5060184	16.96169	172.42865
95.034889	0.8344275	0.4479994	183.29386	148.13504
56.429363	0.8034144	0.512033	188.19358	95.192344
-26.80464	0.8269462	0.5648394	248.30817	160.28037
37.528074	0.8237037	0.5152814	210.00966	119.79652
146.70521	0.726783	0.5247418	122.58397	116.94632
54.130722	0.8215895	0.5409216	152.56714	121.78319
127.23328	0.7860171	0.4606321	152.71436	126.71854
108.9139	0.8278363	0.451987	164.34968	130.76373
172.68405	0.8014058	0.4348747	100.04885	160.04127
149.89952	0.8708436	0.3980935	126.54852	135.97513
204.45869	0.7150476	0.4728708	50.703137	158.04304
204.73245	0.7588977	0.4569018	50.401428	140.14979
48.24661	0.7643088	0.578759	168.81983	94.612231
212.74153	0.6909118	0.4949806	65.387335	114.54341
154.3806	0.7647785	0.4732514	100.33252	135.596
82.529557	0.863054	0.4602228	170.9251	136.36343
91.448138	0.8744237	0.4479087	137.59647	122.84374
85.642812	0.7453092	0.5656518	120.83418	139.61852
-53.86677	0.9838298	0.5118824	209.02699	137.80094
-44.03087	0.9211597	0.5330948	231.01195	145.54914
33.476292	0.8869307	0.4903305	201.99161	130.13365
118.03371	0.8565926	0.4125398	163.77571	157.6522
176.12282	0.7318312	0.5069047	65.929068	117.85237
170.951	0.7348283	0.5116183	76.398999	120.09055
207.87794	0.7292638	0.4909965	58.43892	120.68687
176.56194	0.7316756	0.4711106	94.535783	142.05142
94.192996	0.7787491	0.5189832	154.40352	131.75165
-5.099673	0.8711762	0.5164152	227.65588	134.52252

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result_e				
77.512684	0.8761644	0.4588261	153.55715	133.34844
137.27675	0.7876336	0.4763717	126.90471	119.62067
128.82349	0.8347437	0.4336269	145.81878	179.34819
120.16683	0.7930507	0.477923	138.38189	138.56191
196.0555	0.7584021	0.4752911	63.67157	106.34914
82.673211	0.854328	0.5245743	105.80069	159.91062
63.736065	0.7786833	0.5601541	120.93788	145.11306
69.753609	0.8253645	0.4576268	187.42099	148.46695
166.58647	0.8174622	0.4518104	76.266137	128.76978
-146.912	0.8216701	0.674425	321.98698	84.137193
176.32662	0.7899717	0.4827975	63.50421	135.16057
45.845355	0.8174487	0.5351518	186.30522	123.04129
132.68787	0.8894199	0.4448822	90.356497	127.60634
228.84944	0.6838721	0.4882671	50.255311	142.81963
-7.892358	0.8283762	0.57016	209.2887	143.27223
82.57388	0.8677197	0.4773091	157.74581	145.29323
112.07153	0.8675845	0.4561376	130.80978	146.59217
130.53376	0.8067855	0.4779385	121.7736	133.55005
89.285288	0.9125835	0.4446977	112.76689	166.65023
136.23398	0.7588526	0.5107106	111.87928	127.83612
120.26326	0.7798072	0.4639046	171.12632	140.96162
99.09512	0.7561938	0.5000605	171.18615	126.67137
-23.03811	0.8212614	0.5823104	217.1977	116.48801
102.16556	0.786324	0.4997516	146.23639	143.54968
-103.8994	0.8041061	0.5972412	336.09537	95.692371
119.42183	0.8218376	0.4696494	125.76492	194.63198
123.52246	0.7900628	0.5333525	93.005825	126.57136
71.75434	0.8184434	0.5318727	137.77891	129.13753
61.025498	0.8597314	0.4897523	161.12844	140.94525

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3e average

areult_e

93.834287 0.8117201 0.4970279 145.00287 135.39209