

1 **BUAN 6357.sw1 (Spring 2023) Johnston**

2 **Exam 2: Bootstrap**

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3
4 > ###
5 > #
6 > # BUAN 6357 Spring 2023 (Johnston) - Exam 2: Bootstrap
7 > #
8 > ###
9 > options(scipen=10,width=70)
10 >
11 > wd <- "c:/data/BUAN6357/exams/exam2" # change as needed
12 > setwd(wd)
13 > raw <- read.csv("olsData.csv")
14 > raw <- raw[complete.cases(raw),]
15 >
16 > require(tidyverse)
17 Loading required package: tidyverse
18 -- Attaching packages ----- tidyverse 1.3.2
19 --
20 v ggplot2 3.4.0      v purrr 0.3.5
21 v tibble 3.1.8       v dplyr 1.0.10
22 v tidyr 1.2.1        v stringr 1.5.0
23 v readr 2.1.3        v forcats 0.5.2
24 -- Conflicts ----- tidyverse_conflicts()
25 --
26 x dplyr::filter() masks stats::filter()
27 x dplyr::lag()     masks stats::lag()
28 > require(broom)
29 Loading required package: broom
30 > require(data.table)
31 Loading required package: data.table
32 data.table 1.14.6 using 4 threads (see ?getDTthreads). Latest news:
33 r-datatable.com
34
35 Attaching package: 'data.table'
36
37 The following objects are masked from 'package:dplyr':
38
39     between, first, last
40
41 The following object is masked from 'package:purrr':
42
43     transpose
44
45 >
46 > s <- 410350638
47 >
48 > mdl <- V13~.
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49 >
50 > uF1 <- function (lbl,v,alpha=0.05) {
51 +   z     <- qnorm(1-(alpha/2)); m  <- mean(v);   s  <- sd(v)
52 +   lbP   <- m-z*s;      ubP <- m+z*s
53 +   lo    <- alpha/2;   hi   <- 1-lo
54 +   ci    <- quantile(v, c(lo,hi)); mu  <- mean((v-m)^2)
55 +   tnm   <- quantile(v, c(.25, .5, .75))
56 +   return (data.table(lbl=lbl, m=m, s=s, z=z, lbP=lbP, ubP=ubP,
57 +                      lbNP=ci[1], ubNP=ci[2],
58 +                      q1= tnm[1], q2=tnm[2], q3=tnm[3],
59 +                      mse=mu, rmse=sqrt(mu)))
60 + }
61 >
62 > r0  <- lm mdl, data=raw)
63 > s0  <- tidy(r0, conf.int=T)
64 > as.data.frame(s0)
65      term      estimate  std.error  statistic      p.value
66 1 (Intercept) 36.452058772 3.657639449   9.9660066 2.344061e-22
67 2          V1 -0.132092352 0.024201246  -5.4580806 6.088358e-08
68 3          V2  0.048398518 0.010216102   4.7374742 2.481079e-06
69 4          V3  0.009309370 0.044410180   0.2096224 8.340056e-01
70 5          V4  3.808456727 0.622693710   6.1160996 1.380123e-09
71 6          V5 -13.827347275 2.785964413  -4.9632175 8.163627e-07
72 7          V6  4.183516512 0.313405222  13.3485858 1.736683e-37
73 8          V7 -0.009564162 0.009976447  -0.9586742 3.379577e-01
74 9          V8 -1.374112496 0.147362015  -9.3247402 7.086016e-20
75 10         V9  0.317373923 0.051900230   6.1150773 1.388674e-09
76 11         V10 -0.015926751 0.002932966  -5.4302544 7.085973e-08
77 12         V11 -0.978573911 0.092255027 -10.6072693 5.738581e-25
78 13         V12 -0.437188402 0.038062898 -11.4859463 9.495913e-29
79      conf.low  conf.high
80 1 29.27441538 43.62970217
81 2 -0.17958416 -0.08460054
82 3  0.02835074  0.06844629
83 4 -0.07783985  0.09645859
84 5  2.58650102  5.03041243
85 6 -19.29444138 -8.36025317
86 7  3.56849938  4.79853364
87 8 -0.02914165  0.01001332
88 9 -1.66329135 -1.08493364
89 10  0.21552645  0.41922140
90 11 -0.02168232 -0.01017119
91 12 -1.15961245 -0.79753538
92 13 -0.51188191 -0.36249490
93 >
94 > (n <- nrow(raw) )
95 [1] 1000
96 > (b <- 750      )
97 [1] 750

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98 >
99 > set.seed(s)
100 > t <- data.table(grp=rep(1:b,each=n), idx=sample(n,n*b,replace=T))
101 > b1 <- t[,tidy(lm(mdl,data=raw[idx,]),conf.int=T), by=grp]
102 > (s1 <- b1[term!="(Intercept)",uFl("b1",estimate),by=term] )
103   term lbl      m      s      z      lbP
104 1:  V1  b1 -0.131349309 0.02395885 1.959964 -0.17830780
105 2:  V2  b1  0.048366320 0.01040703 1.959964  0.02796892
106 3:  V3  b1  0.005987587 0.04241425 1.959964 -0.07714281
107 4:  V4  b1  3.788449033 0.58573235 1.959964  2.64043473
108 5:  V5  b1 -13.702217645 3.09702971 1.959964 -19.77228434
109 6:  V6  b1  4.177704908 0.32231878 1.959964  3.54597171
110 7:  V7  b1 -0.009990270 0.01068252 1.959964 -0.03092763
111 8:  V8  b1 -1.375299018 0.14837876 1.959964 -1.66611604
112 9:  V9  b1  0.316898890 0.05397043 1.959964  0.21111879
113 10: V10 b1 -0.015840966 0.00294195 1.959964 -0.02160708
114 11: V11 b1 -0.978406436 0.09681476 1.959964 -1.16815988
115 12: V12 b1 -0.437356462 0.03735427 1.959964 -0.51056949
116      ubP      lbNP      ubNP      q1      q2
117 1: -0.08439082 -0.17676617 -0.08550949 -0.14754194 -0.131267542
118 2:  0.06876373  0.02917692  0.06954000  0.04143604  0.047996085
119 3:  0.08911798 -0.07604392  0.08840581 -0.02366744  0.004327057
120 4:  4.93646333  2.62442553  4.86650929  3.42974829  3.793345742
121 5: -7.63215095 -19.64698019 -7.71899361 -15.86642599 -13.636279171
122 6:  4.80943810  3.51420419  4.80270725  3.96626499  4.181870784
123 7:  0.01094709 -0.03041023  0.01133691 -0.01742185 -0.010272144
124 8: -1.08448199 -1.67236872 -1.08163064 -1.47263596 -1.369188522
125 9:  0.42267899  0.20728607  0.41744956  0.27955634  0.317718568
126 10: -0.01007485 -0.02135876 -0.00982501 -0.01790483 -0.015804457
127 11: -0.78865300 -1.16717878 -0.79785139 -1.04039559 -0.978165443
128 12: -0.36414343 -0.51301272 -0.36693964 -0.46237034 -0.437483869
129      q3      mse      rmse
130 1: -0.115161813 0.000573261265 0.023942875
131 2:  0.055105706 0.000108161873 0.010400090
132 3:  0.036560835 0.001796569616 0.042385960
133 4:  4.177917794 0.342624936972 0.585341727
134 5: -11.692074726 9.578804258554 3.094964339
135 6:  4.395436318 0.103750875491 0.322103827
136 7: -0.002984607 0.000113964154 0.010675399
137 8: -1.285255913 0.021986901503 0.148279808
138 9:  0.354149511 0.002908923736 0.053934439
139 10: -0.013947192 0.000008643532 0.002939989
140 11: -0.913137647 0.009360599962 0.096750194
141 12: -0.410996058 0.001393481251 0.037329362
142 >
143 > set.seed(s)
144 > t <- data.table(grp=rep(1:b, each=n), idx=sample(rep(1:n,b)))
145 > b2 <- t[,tidy(lm(mdl,data=raw[idx,]),conf.int=T), by=grp]
146 > (s2 <- b2[term!="(Intercept)",uFl("b2",estimate),by=term] )

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147		term	lbl		m		s		z		lbP
148	1:	V1	b2	-0.132451691	0.02534688	1.959964	-0.18213066				
149	2:	V2	b2	0.048428416	0.01062243	1.959964	0.02760884				
150	3:	V3	b2	0.008912241	0.04415361	1.959964	-0.07762725				
151	4:	V4	b2	3.808936602	0.60520137	1.959964	2.62276372				
152	5:	V5	b2	-13.813201367	2.99354167	1.959964	-19.68043523				
153	6:	V6	b2	4.181952342	0.31848324	1.959964	3.55773667				
154	7:	V7	b2	-0.009484624	0.01033211	1.959964	-0.02973518				
155	8:	V8	b2	-1.374217705	0.14417912	1.959964	-1.65680360				
156	9:	V9	b2	0.317193402	0.05491572	1.959964	0.20956058				
157	10:	V10	b2	-0.015888518	0.00291825	1.959964	-0.02160818				
158	11:	V11	b2	-0.978652375	0.09720702	1.959964	-1.16917464				
159	12:	V12	b2	-0.437696474	0.03898981	1.959964	-0.51411511				
160			ubP		lbNP		ubNP		q1		q2
161	1:		-0.08277273	-0.18157743	-0.084188357	-0.15009241	-0.132628254				
162	2:		0.06924799	0.02761291	0.069415224	0.04131088	0.048669792				
163	3:		0.09545173	-0.07439786	0.093341628	-0.02212578	0.010829348				
164	4:		4.99510948	2.53873326	5.013852297	3.40731883	3.820337957				
165	5:		-7.94596751	-19.37717327	-7.867469589	-15.88138101	-13.916219996				
166	6:		4.80616801	3.58331235	4.776014770	3.96440650	4.177725169				
167	7:		0.01076593	-0.03090875	0.011026923	-0.01666267	-0.009395327				
168	8:		-1.09163181	-1.65786393	-1.088666707	-1.47093847	-1.374603641				
169	9:		0.42482623	0.21341251	0.422281685	0.27936009	0.317056413				
170	10:		-0.01016885	-0.02137044	-0.009668704	-0.01776810	-0.016001178				
171	11:		-0.78813011	-1.17178320	-0.794564022	-1.04542471	-0.976724674				
172	12:		-0.36127784	-0.50872613	-0.360766678	-0.46307998	-0.439160110				
173			q3		mse		rmse				
174	1:		-0.114627097	0.00064160750	0.025329972						
175	2:		0.055500299	0.00011268551	0.010615343						
176	3:		0.040734073	0.00194694210	0.044124167						
177	4:		4.200721243	0.36578033443	0.604797763						
178	5:		-11.772988538	8.94934334338	2.991545310						
179	6:		4.400412774	0.10129632896	0.318270842						
180	7:		-0.002985099	0.00010661011	0.010325217						
181	8:		-1.280219075	0.02075990314	0.144082973						
182	9:		0.353153657	0.00301171498	0.054879094						
183	10:		-0.014112911	0.00000850483	0.002916304						
184	11:		-0.913583777	0.00943660618	0.097142196						
185	12:		-0.412940286	0.00151817867	0.038963812						
186			>								