

STAT 615(Baron)

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/* Computing p-value for the Shapiro-Wilk test of normality
   for small samples, using Monte Carlo simulations */

DATA A;
INFILE pulse;
INPUT row pulse1 pulse2 ran smokes sex height weight activity;

PROC PRINT DATA=A; TITLE 'Data set A. Initial sample';

PROC UNIVARIATE DATA=A NOPRINT; /* supresses the output */
VAR height;
OUTPUT OUT=B NORMAL=Wobs N=N; /* save Shapiro-Wilk statistic and sample size */

DATA B; SET B; Nruns = 1000; /* Nruns = number of MC runs */

PROC PRINT DATA=B; TITLE 'Data set B. Observed statistic';

DATA MC; SET B;
RETAIN SEED 1660519;
DO MCrunch=1 TO Nruns;
DO j=1 TO N; /* Generate Nruns samples of */
CALL RANNOR(SEED, X); /* size N of normal variables */
OUTPUT;
END;
END;

PROC PRINT DATA=MC; TITLE 'Data set MC. Simulated samples';

PROC UNIVARIATE DATA=MC NOPRINT;
VAR X;
CLASS MCrunch; /* Compute Shapiro-Wilk statistic W */
OUTPUT OUT=C NORMAL=W; /* for each sample */

DATA B; SET B; /* Make K to have the same */
DO i=1 TO Nruns; OUTPUT; END; /* dimension as Kgenerated */

DATA D; MERGE B C; /* The indicator is 1 if */
indicator = (W < Wobs); /* W < Wobs and 0 if W > Wobs */

PROC PRINT DATA=D; TITLE 'Data set D. Results of simulations';

PROC MEANS DATA=D NOPRINT; /* The probability of W<Wobs */
VAR indicator; /* is estimated by the */
OUTPUT OUT=E MEAN=Pvalue; /* proportion of W < Wobs */

PROC PRINT DATA=E; TITLE 'Estimated p-value';
VAR Pvalue; /* Report the p-value */

RUN;

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Monte Carlo
method of
estimating
p-values

Data set A. Initial sample

Obs	row	pulse1	pulse2	ran	smokes	sex	height	weight	activity
1	1	64	88	1	2	1	66.00	140	2
92	92	76	76	2	2	2	61.75	108	2

Data set B. Observed statistic

Obs	N	Wobs	Nruns
1	92	0.96656	10000

Data set MC. Simulated samples

Obs	N	Wobs	Nruns	SEED	MCrun	j	X
1	92	0.96656	10000	1597779957	1	1	-0.02050
920000	92	0.96656	10000	404972177	10000	92	0.33889

Data set D. Results of simulations

Obs	N	Wobs	Nruns	i	MCrun	W	indicator
1	92	0.96656	10000	1	1	0.99086	0
10000	92	0.96656	10000	10000	10000	0.99215	0

Estimated p-value

Obs	Pvalue
1	0.0181