Two Stage Cluster Sampling Simulation Results

Nengak Emmanuel Goltong

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Simulation Results

This simulation exercise consist of the following steps:

1. Six independent variables (normally distributed) are simulated (a total of N times M)
2. The simulated data is then split into M distinct clusters each of size N. The variables Y, X and Z are constructed following the relationship defined in the work of Maji et al. only that here, the error component is added.
3. A random sample of m (or m' then m) clusters is selected out of the M total clusters. This is called the first sampled units (fsu).
4. A random sample of n (or n' then n) units are sampled from each of m selected clusters. This is called the second sampled units (ssu).
5. All the different estimators of the Mean Square Error are calculated based on the observed data and compared.
6. Steps 3 to 5 are repeated a hundred times for each specific case and the estimates of Mean Square Error are all saved in arrays after which the means are calculated and compared.
7. Coding can be fun and challenging. What do you think?

Table 1. Artificial Population study (when r is not varying)

Case A, Procedure I (N = 10, M = 10, n' = 7, n = 5, m = 7)

p	q	PRE_Maji	PRE_Ibrahim	LOSS_Maji	LOSS_Ibrahim
0.05	0.95	240.7166	247.7131	-140.7166	-147.7131
0.1	0.9	234.2475	254.8227	-134.2475	-154.8227
0.15	0.85	227.8759	266.1662	-127.8759	-166.1662
0.2	0.8	221.5513	280.8098	-121.5513	-180.8098

Table 2. Artificial Population study (when r is not varying)

Case B, Procedure I (N = 10, M = 10, n' = 7, n = 5, m = 7)

p	q	PRE_Maji	PRE_Ibrahim	LOSS_Maji	LOSS_Ibrahim
0.05	0.95	287.1852	309.8038	-187.1852	-209.8038
0.1	0.9	276.1314	325.5487	-176.1314	-225.5487
0.15	0.85	265.463	344.4662	-165.463	-244.4662
0.2	0.8	255.1155	367.6047	-155.1155	-267.6047

Table 3. Artificial Population study (when r is not varying)

Procedure II (N = 10, M = 10, n = 5, m' = 8, m = 7)

p	q	PRE_Maji	PRE_Ibrahim	LOSS_Maji	LOSS_Ibrahim
0.05	0.95	228.7942	120.1068	-128.7942	-20.10682
0.1	0.9	234.1931	148.4815	-134.1931	-48.48153
0.15	0.85	253.0895	211.4755	-153.0895	-111.4755
0.2	0.8	1767.786	264.3053	-1667.786	-164.3053

Table 4. Artificial Population study (when r is varying)

Case A, Procedure I (N = 10, M = 10, n' = 7, n = 4, m = 7)

p1	q1	p2	q2	p3	q3	p4	q4	PRE_Maji	PRE_Ibrahim	LOSS_Maji	LOSS_Ibrahim
0.05	0.95	0.05	0.95	0.05	0.95	0.1	0.9	278.6145	254.9173	-178.6145	-154.9173
0.05	0.95	0.05	0.95	0.1	0.9	0.05	0.95	278.7064	255.0313	-178.7064	-155.0313
0.05	0.95	0.05	0.95	0.1	0.9	0.1	0.9	276.8989	254.4278	-176.8989	-154.4278
0.1	0.9	0.1	0.9	0.1	0.9	0.05	0.95	275.0897	254.0803	-175.0897	-154.0803
0.1	0.9	0.15	0.85	0.05	0.95	0.05	0.95	274.8001	253.6213	-174.8001	-153.6213
0.1	0.9	0.1	0.9	0.1	0.9	0.15	0.85	271.5271	253.2227	-171.5271	-153.2227

Table 5. Artificial Population study (when r is varying)

Case B, Procedure I (N = 10, M = 10, n' = 7, n = 4, m = 7)

p1	q1	p2	q2	p3	q3	p4	q4	PRE_Maji	PRE_Ibrahim	LOSS_Maji	LOSS_Ibrahim
0.05	0.95	0.05	0.95	0.05	0.95	0.1	0.9	293.0767	265.191	-193.0767	-165.191
0.05	0.95	0.05	0.95	0.1	0.9	0.05	0.95	292.7693	264.9849	-192.7693	-164.9849
0.05	0.95	0.05	0.95	0.1	0.9	0.1	0.9	290.5565	264.5681	-190.5565	-164.5681
0.1	0.9	0.1	0.9	0.1	0.9	0.05	0.95	287.7565	263.9043	-187.7565	-163.9043
0.1	0.9	0.15	0.85	0.05	0.95	0.05	0.95	287.5897	263.2503	-187.5897	-163.2503
0.1	0.9	0.1	0.9	0.1	0.9	0.15	0.85	283.4256	263.4702	-183.4256	-163.4702

Table 6. Artificial Population study (when r is varying)

Procedure II (N = 10, M = 10, n = 4, m' = 8, m = 7)

p1	q1	p2	q2	p3	q3	p4	q4	PRE_Maji	PRE_Ibrahim	LOSS_Maji	LOSS_Ibrahim
0.05	0.95	0.05	0.95	0.05	0.95	0.1	0.9	266.1098	122.7567	-166.1098	-22.75673
0.05	0.95	0.05	0.95	0.1	0.9	0.05	0.95	266.8984	122.7514	-166.8984	-22.75141
0.05	0.95	0.05	0.95	0.1	0.9	0.1	0.9	269.011	128.5508	-169.011	-28.55079
0.1	0.9	0.1	0.9	0.1	0.9	0.05	0.95	272.7992	136.7851	-172.7992	-36.7851
0.1	0.9	0.15	0.85	0.05	0.95	0.05	0.95	271.8519	134.3659	-171.8519	-34.3659
0.1	0.9	0.1	0.9	0.1	0.9	0.15	0.85	280.343	159.5629	-180.343	-59.5629