MF - first results

1 Population structure

We fix the following population parameters:

$N = 70000$

$N_a = 10000$

$N_b = 10000$

$N_c = 10000$

$N_{ab} = 10000$

$N_{ac} = 10000$

$N_{bc} = 10000$

$N_{abc} = 10000$

Then simulate the study variable Y following Lohr and Rao 2005.

$Y_{ik} = \mu_k + \epsilon_{ik}$

where k represents the domain, μ_k is the average of domain k and $\epsilon_{ik} \sim N(0, \sigma_k)$

Scenario 1

$[\mu_a, \mu_b, \mu_c, \mu_{ab}, \mu_{bc}, \mu_{ac}, \mu_{abc}] = [15, 15, 15, 15, 15, 15, 15]$
$[\sigma_a, \sigma_b, \sigma_c, \sigma_{ab}, \sigma_{bc}, \sigma_{ac}, \sigma_{abc}] = [1, 1, 1, 1, 1, 1, 1]$

Scenario 2

Tabella 1: Frames parameters

frame	Mean	St. Dev.	CV
A	15	1	0.07
B	15	1	0.07
C	15	1	0.07

Tabella 2: Frames parameters

frame	Mean	St. Dev.	CV
A	15	2.9	0.19
B	15	2.9	0.19
C	15	4	0.27

Tabella 3: Frames parameters

frame	Mean	St. Dev.	CV
A	15	2.9	0.19
B	15	2.9	0.19
C	15	1	0.07

$[\mu_a, \mu_b, \mu_c, \mu_{ab}, \mu_{bc}, \mu_{ac}, \mu_{abc}] = [15, 15, 15, 15, 15, 15, 15]$
$[\sigma_a, \sigma_b, \sigma_c, \sigma_{ab}, \sigma_{bc}, \sigma_{ac}, \sigma_{abc}] = [1, 1, 4, 1, 4, 4, 4]$

Scenario 3

$[\mu_a, \mu_b, \mu_c, \mu_{ab}, \mu_{bc}, \mu_{ac}, \mu_{abc}] = [15, 15, 15, 15, 15, 15, 15]$
$[\sigma_a, \sigma_b, \sigma_c, \sigma_{ab}, \sigma_{bc}, \sigma_{ac}, \sigma_{abc}] = [4, 4, 1, 4, 1, 1, 1]$

2 Sampling design

Simple Random Sampling without replacement

$n = 600$; $f_A = f_B = f_C = 0.005 = \frac{200}{40000}$

Sampling sequence: A -¿ B -¿ C

Screener design: *1)* without reallocation of n; *2)* n reallocated in the cheapest frame; *3)* n reallocated in frame B and then C

Overlap design

3 Results

Considero $n_A = 100$, $n_B = 200$, $n_C = 300$ and Scenario 2:

Tabella 4: Number of discarded units

frame	Min.	Median	Mean	Max.
A	125.00	150.00	150	172
B	77.0	100.0	100	126

Tabella 5: Empirical Mean Squard error and Average cost

	Empirical Mean Squared Error				Average cost			
Scenario	Y_M	Y_str_1	Y_str_2	Y_str3	Y_M	Y_str_1	Y_str_2	Y_str3
1	19044.56	3733.124	3073.348	3046.242	2000	919.5383	1256.292	1170.4
2	20833.18	11513	8438.607	7805.059	2000	919.5383	1256.292	1170.4
3	20959.44	10316.19	9307.697	9830.041	2000	919.5383	1256.292	1170.4

Tabella 6: Empirical Mean Squard error and Average cost

	Empirical Mean Squared Error				
Scenario	Y_M	Y_{KA}	Y_str_1	Y_str_2	Y_str3
2	21472.71	24152.71	9575.046	8119.957	7560.884