THE UNIVERSITY OF BRITISH COLUMBIA

DEPARTMENT OF STATISTICS

TECHNICAL REPORT #261
(Correction to: TR #253)

RIZVI-SOBEL SUBSET SELECTION WITH UNEQUAL SAMPLE SIZES

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December 2010

CORRECTION TO:
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Technical Report #253
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The present manuscript contains a corrected version of Section 3 of the Technical Report #253.

The procedure for the smallest quantile

As in Section 2, the conditions on the F_i are the ones used by RS, i.e. the F_i satisfy

$$\max_{1\leq i\leq k} F_{[i]}(y) = F_{[1]}(y) \text{ for all } y. \tag{3.1}$$

Further, as before, the F_i are continuous and have a unique α-quantile, but in this case the integers r_i and c_i satisfiy

$$1 \leq r_i \leq (n_i+1)\alpha < r_i + 1 \leq n_i + 1 \text{ and } 0 \leq c_i \leq n_i - r_i. \tag{3.2}$$

The proposed procedure is then

$$R_2: \text{ put } F_i \text{ in the subset } \Leftrightarrow Y_{r_i,i} \leq \min_{1\leq j\leq k, j\neq i} Y_{r_j+c_j,j} \tag{3.3}$$

and when $F_i = F_{[1]}$ the probability of a correct selection is

$$P_{i,d_i}(CS \mid R_2) = P(Y_{r_i,i} \leq \min_{1\leq j\leq k, j\neq i} Y_{r_j+c_j,j}), \tag{3.4}$$

where, as for the case of the largest quantile, the probability of correct selection when $F_i = F_{[1]}$ depends on the c's only through $d_i = (c_1, \ldots, c_{i-1}, c_{i+1}, \ldots, c_k)$.

Using (2.1) and (2.5) then gives, for the case where $F_i = F_{[1]}$,

$$\left.\begin{array}{l} P_{i,d_i}(CS \mid R_2) = \\ P(Y_{r_i,i} \leq \min_{1\leq j\leq k, j\neq i} Y_{r_j+c_j}) = \\ \int_{-\infty}^{\infty} \prod_{j\neq i} \left(1 - I_{F_j(y)}(r_j + c_j, n_j - (r_j + c_j + 1)\right) dI_{F_i(y)}(r_i, n_i - r_i + 1) \\ \geq \int_{-\infty}^{\infty} \prod_{j\neq i} (1 - I_u(r_j + c_j, n_j - (r_j + c_j) + 1)\, dI_u(r_i, n_i - r_i + 1). \end{array}\right\} \quad (3.6)$$

Calling this lowerbound on $P_{i,d_i}(CS \mid R_2)$, $L^*_{i,d_i}(CS \mid R_2)$, we have, because $0 \leq c_i \leq n_i - r_i$ and $I_u(r, n - r + 1)$ is for fixed $u \in (0, 1)$ decreasing in r,

$$A_i^* \leq L^*_{i,d_i}(CS \mid R_2) \leq B_i^*, i = 1, \ldots, k \quad (3.7)$$

where, for $i = 1, \ldots, k$,

$$A_i^* = \int_0^1 \prod_{j\neq i} (1 - I_u(r_j, n_j - r_j + 1))\, dI_u(r_i, n_i - r_i + 1)) \quad (3.8)$$

and

$$B_i^* = \int_0^1 \prod_{j\neq i} (1 - I_u(n_j, 1))\, dI_u(r_i, n_i - r_i + 1). \quad (3.9)$$

Further note that (by a proof similar to the one for (2.15))

$$\sum_{i=1}^{k} A_i^* = 1 \text{ for all } r_i, n_i \text{ satisfying (3.2)}, \quad (3.10)$$

implying that $\min_{1\leq i\leq k} A_i^* \leq 1/k$ and by a proof similar to the one for (4.1)

$$B_i^* = 1 - \frac{n_i!(n_j + r_i - 1)!}{(r_i - 1)!(n_i + n_j)!}\; i \neq j$$

when $k = 2$.

Finally, Theorem 2.1 with, for $i = 1, \ldots, k$, (A_i, B_i) replaced by (A_i^*, B_i^*), gives $(c_1, \ldots, c_k)$ and the possible P^* such that $\min_{1\leq i\leq k} P_{i,d_i}(CS \mid R_2) \geq P^*$.