Appendix

I_y and I_{prs} are standardized, dividing I_y and I_{prs} by σ_{I_y} and $\sigma_{I_{prs}}$, respectively.

Standardized I_y and I_{prs} are termed as st(I_y) and st(I_{prs}), respectively. Standardized I_y and I_{prs} are shown in figure 1.

First, we obtain the values of v_1 and v_2 from two independent standard normal distributions as truncation points for intended selection percentage of first and second selection, respectively.

The conditional distribution of st(I_{prs}) given st$(I_y) = v_1$ distributes with average of $r_{st(I_y),st(I_{prs})}$ and with standard deviation of $\sqrt{1-r^2_{st(I_y),st(I_{prs})}}$, where $r_{st(I_y),st(I_{prs})}$ is correlation between $st(I_y)$ and $st(I_{prs})$. On the other hand, v_2 is defined as the truncation point of a standard normal random variable with average of 0 and with standard deviation of 1 for the intended selection percentage of the second selection. So the truncation point of the conditional distribution of $st(I_{prs})$ given st$(I_y) = v_1$ is $r_{st(I_y),st(I_{prs})}v_1 + v_2\sqrt{1-r^2_{st(I_y),st(I_{prs})}}$. Consequently, that truncation point corresponds to that of a standard normal random variable with average of 0 and with standard deviation of 1, that is, $st(I_{prs})$. This truncation point for second selection is in agreement with Cerón-Rojas JJ, et al [3,4].

Consequently, selection intensity for $st(I_{prs})$ becomes $\frac{\frac{1}{\sqrt{2\pi}}\exp(-0.5u_2^2)}{p_2}$, where $u_2 = r_{st(I_y),st(I_{prs})}v_1 + v_2\sqrt{1-r^2_{st(I_y),st(I_{prs})}}$, $r_{st(I_y),st(I_{prs})} = r_{I_yI_{prs}}$ and P_2 is the selected proportion at the second-stage. Note that selection intensity for the second-stage selection varies during generations because $r_{I_yI_{prs}}$ varies during generations, although the intended selection percentage of the second-stage selection is constant during generations.

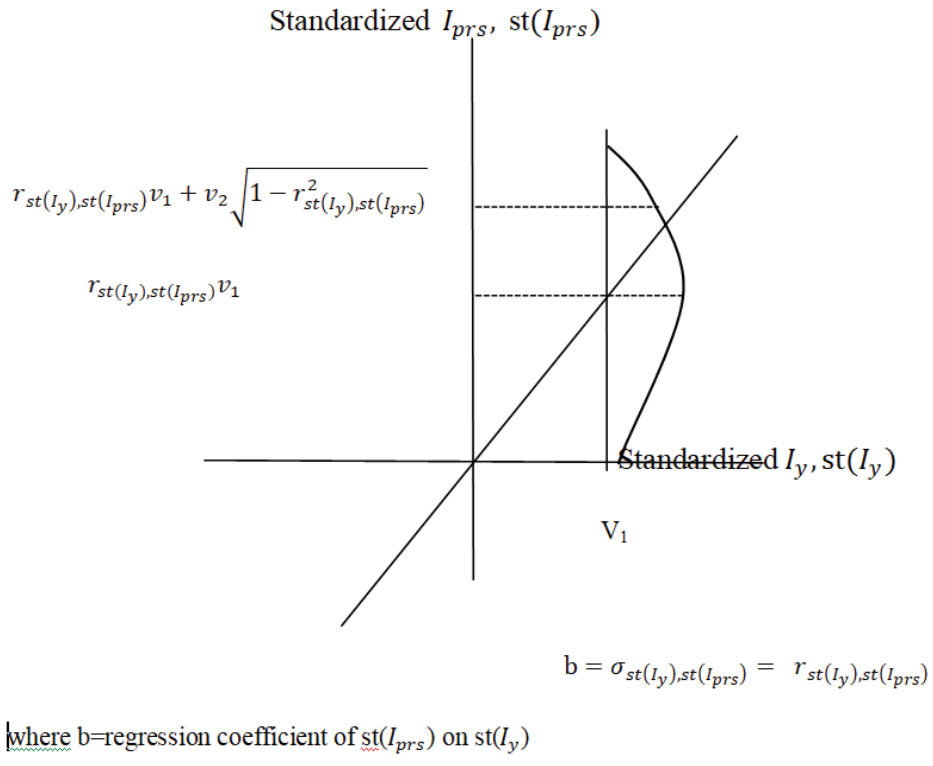

Figure 1: Standardized selection index for second (st(I_{prs}))and first (st(I_y)) selection.