

# A COMPARISON OF DIRECT AND INDIRECT CONVERSIONS<sup>1</sup>

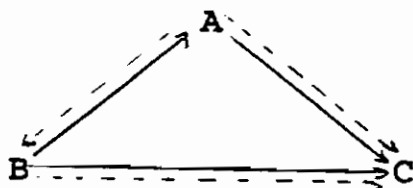
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## OBJECTIVE:

EVALUATE THE VALIDITY OF INDIRECT CONVERSIONS

USING SIMULATED DATA



—————→ DIRECTION OF CONVERSION

- - - - -→ GENE FLOW

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<sup>1</sup> Presented at the INTERBULL meeting, June 7-8 1992, Neustift, Austria.

DATA:

3 POPULATIONS

A: 2000 BULLS

$S_A$ : TRUE MERIT

$P_A$ : SIRE PROOF

$V_A$ : GENETIC VARIANCE = 1

$H^2_A$ : HERITABILITY = .30

$W_A$ : ACCURACY SQUARED

B: 1000 BULLS

$S_B$ : TRUE MERIT

$P_B$ : SIRE PROOF

$V_B$ : GENETIC VARIANCE

$H^2_B$ : HERITABILITY = .30

$W_B$ : ACCURACY SQUARED

C: 1000 BULLS

$S_C$ : TRUE MERIT

$P_C$ : SIRE PROOF

$V_C$ : GENETIC VARIANCE

$H^2_C$ : HERITABILITY = .30

$W_C$ : ACCURACY SQUARED

PARAMETERS STUDIED:

$$V_A = 1$$

$$\frac{V_B}{V_A} = 1 \quad \text{OR} \quad 2$$

$$\frac{V_C}{V_A} = 1 \quad \text{OR} \quad 2$$

$$\frac{V_C}{V_B} = 1 \quad \text{OR} \quad 2$$

GENETIC CORRELATION:

$$RG_{AB} = 1 \quad \text{OR} \quad .80$$

$$RG_{AC} = 1 \quad \text{OR} \quad .80$$

$$RG_{BC} = 1 \quad \text{OR} \quad .80$$

REFERENCE BASE:

$$G_A - G_B = 0 \quad \text{OR} \quad 50$$

$$G_A - G_C = 0 \quad \text{OR} \quad 50$$

$$G_B - G_C = 0 \quad \text{OR} \quad 50$$

A  $\longrightarrow$  B

# SELECT ON  $P_A$

# ASSUME  $\text{VAR}(W_A) = \text{VAR}(W_B) = 0$

# DIRECT CONVERSION:

$$P_B = a'_{AB} + b'_{AB} * P_A$$

TRUE  $\beta'_{AB} = \beta_{AB}$

ESTIMATED  $b'_{AB} = b_{AB}$

$$a'_{AB} = \bar{P}_B - b'_{AB} * \bar{P}_A$$

# OPPOSITE CONVERSION:

$$P_A = a'_{BA} + b'_{BA} * P_B$$

TRUE  $\beta'_{BA} = \beta_{BA} * \frac{1 - W_A * \Delta}{1 - W_A * R_{G_{AB}}^2 * \Delta}$

ESTIMATED  $b'_{BA} = b_{BA} * \frac{1 - \Delta}{1 - W_A * W_B * R_{G_{AB}}^2 * \Delta}$

$\Delta =$  SELECTION PARAMETER

$$a'_{BA} = \bar{P}_A - b'_{BA} * \bar{P}_B$$

$$V_A = V_B = 1$$

$$G_A - G_B = 0$$

B SELECTS TOP 30% OF A

A → B

	SLOPE		INTERCEPT	
	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80
TRUE	1.000	.800	.000	.000
ESTIMATED	1.005	.804	-.005	.004

B → A

	SLOPE		INTERCEPT	
	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80
TRUE	1.000	.493*	.000	.651*
ESTIMATED	.570*	.328*	.638*	.877*

B SELECTS RANDOMLY FROM A

A → B

	SLOPE		INTERCEPT	
	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80
TRUE	1.000	.800	.000	.000
ESTIMATED	1.002	.808	.002	.002

B → A

	SLOPE		INTERCEPT	
	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80	RG <sub>AB</sub> =1	RG <sub>AB</sub> = .80
TRUE	1.000	.800	.000	.000
ESTIMATED	.997	.798	.001	.003

B—————C

INDIRECT:

$$P_C = (a_{AC} + b_{AC} * a_{BA}) + (b_{AC} * b_{BA}) * P_B$$

DIRECT:

$$P_C = a_{BC} + b_{BC} * P_B$$

# C SELECTS 30% OF B

# SPLIT SELECTED DATA IN TWO SUBSETS

# GET SETS OF DIRECT CONVERSIONS

# APPLY ON BULLS IN B W/O PROOFS IN C

a) ALL OTHER BULLS

b) BULLS IN OTHER SUBSET

# DO VARIOUS COMPARISONS

$$V_B = V_C = 1$$

$$G_B - G_C = 0$$

$$RG_{AB}=1$$

T: TRUE PARAMETERS

D: DIRECT CONVERSION

I1: INDIRECT CONVERSION, TRUNCATION SELECTION A-->B

I2: INDIRECT CONVERSION, RANDOM SELECTION A-->B

	SLOPE		INTERCEPT	
	$RG_{BC}=1$	$RG_{BC}=.80$	$RG_{BC}=1$	$RG_{BC}=.80$
T	1.000	.800	.000	.000
D	1.002	.805	.002	-.008
I1	.581*	.464*	.630*	.501*
I2	1.006	.807	-.001	.003

APPLY CONVERSIONS ON ALL BULLS IN COUNTRY B

	PC		PC-SC		V(PC-SC)	
	RG <sub>BC</sub> =1	RG <sub>BC</sub> = .8	RG <sub>BC</sub> =1	RG <sub>BC</sub> = .8	RG <sub>BC</sub> =1	RG <sub>BC</sub> = .8
T	-.085	-.142	-.001	.005	.327	.569
D	-.077	-.151	.002	-.007	.332	.572
I1	.580*	.419*	.667*	.566*	.423*	.630*
I2	-.080	-.145	-.004	.010	.335	.571

APPLY CONVERSIONS ON TOP BULLS IN COUNTRY B

	PC		PC-SC		V(PC-SC)	
	RG <sub>BC</sub> =1	RG <sub>BC</sub> = .8	RG <sub>BC</sub> =1	RG <sub>BC</sub> = .8	RG <sub>BC</sub> =1	RG <sub>BC</sub> = .8
T	1.083	.875	.005	.010	.122	.421
D	1.089	.871	.011	.016	.128	.426
I1	1.259*	1.001*	.181*	.146*	.165*	.442*
I2	1.089	.872	.012	.017	.130	.427



# CONCLUSIONS INVARIABLE TO VARIANCE RATIO AND  
REFERENCE BASE DIFFERENCE

# POSSIBLE APPLICATIONS OF SUCH SCENARIO:

TWO EUROPEAN COUNTRIES USING CANADA OR THE USA AS  
THIRD COMMON COUNTRY.

# CONCLUSION:

WHEN DIRECTION OF CONVERSION IS OPPOSITE TO  
DIRECTION OF GENE FLOW AND TRUNCATION SELECTION  
IS PRACTICED, INDIRECT CONVERSIONS WOULD BE BIASED.  
THIS WOULD RESULT IN SIGNIFICANTLY INFLATED  
PREDICTED PROOFS IN THE IMPORTING COUNTRY.

# RECOMMENDATION:

IN THE FIRST LEG OF THE INDIRECT CONVERSION,  
SLOPE ESTIMATION SHOULD NOT BE BASED ON THE DATA.