Assessment of Predictive Ability of MACE for Production Traits of Italian and Foreign Bulls

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Abstract

In November 2004 the first Italian genetic evaluations based on a random regression test day model (RRTDM) were published. A Multiple-Trait-Multiple-Lactation model including four traits and three lactations for each trait is used. The four traits evaluated are kg milk, fat and protein and somatic cell counts. This study was started in order to assess the ability of MACE breeding values to predict later Italian breeding values for production traits (kg milk, kg fat and kg protein). Average differences, correlations and regressions between early MACE EBVs without any Italian daughters with later MACE and Italian EBVs were computed. Further research is ongoing to investigate the predictive ability of MACE over time.

Introduction

For bulls tested abroad mating decisions are usually based on international MACE breeding values based on foreign daughters and calculated by Interbull.

A variety of studies have been undertaken by various researchers to assess the predictive ability of MACE compared with national evaluations. Studies have been published by U.S. (Powell *et al.*, 2000, 2003), French (Brochard *et al.*, 2006) and Australian researchers (McClintock *et al.*, 2003).

The present paper shows some of the initial results of an Italian study on the predictive ability of MACE for production traits of Holstein bulls.

Material and Methods

Holstein bull EBVs from May 2005 till April 2008 were available from Interbull MACE evaluations and Anafi Italian evaluations. All EBVs were adjusted to the most recent Italian genetic base.

Differences between contemporary Italian and MACE bull EBVs were computed for successive index runs.

Breeding values were also compared based on differences from run to run.'

Correlations between early MACE EBVs without any Italian daughters with later MACE and Italian breeding values were computed.
Regression of realized MACE and Italian EBVs on earlier MACE EBVs were computed.

Results and Discussion

Figure 1 shows average differences in EBVs from bulls in contemporary Italian and MACE index runs. For kg milk the average difference always remained below 8 kg. For kg fat and kg protein the average difference was always less than 0.15 kg. This shows that there is no substantial over-/underestimation.

Figure 2 shows the changes in MACE and Italian EBVs for kg milk in successive index runs. The introduction of the test-day model resulted in a temporary disruption in November 2004.

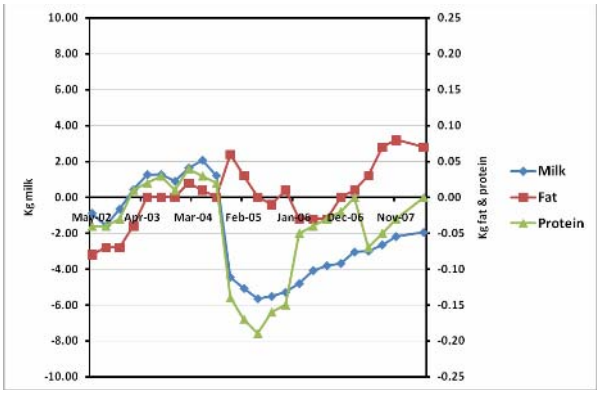

Figure 1. Average differences computed as Italian minus MACE EBVs from bulls with both Italian and MACE EBVs. Note that in November 2004, Italy started with the test-day model.

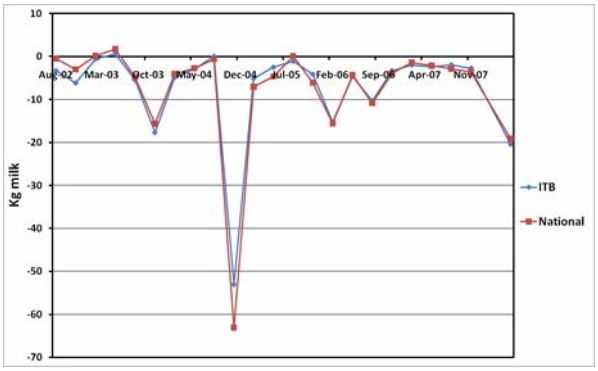

Figure 2. Changes in MACE and Italian EBVs for kg milk in successive index runs. Note that in November 2004, Italy started with the test-day model.

Regressions of MACE and Italian EBVs values with Italian second crop daughters on earlier MACE EBVs based on only foreign first crop daughters are shown in Figure 3, 4 and 5 for kg milk, kg fat and kg protein. The equations for linear trendlines were:

Milk MACE: y = 0.9017x - 13.12, R^2 = 0.803
Milk Italian: y = 0.8547x + 10.34, R^2 = 0.6335
Fat MACE: y = 0.8822x - 0.5038, R^2 = 0.7639
Fat Italian: y = 0.7552x + 2.5508, R^2 = 0.5166
Protein MACE: y = 0.8635x - 0.0007, R^2 = 0.7474
Protein Italian: y = 0.8x + 1.3054, R^2 = 0.5376

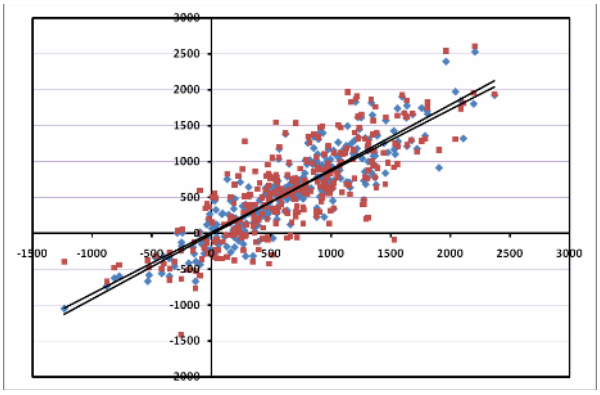

Figure 3. Regression for kg milk of 2/2008 MACE EBVs (blue) and from 2/2008 Italian EBVs (red) on 4/2004 MACE EBVs.

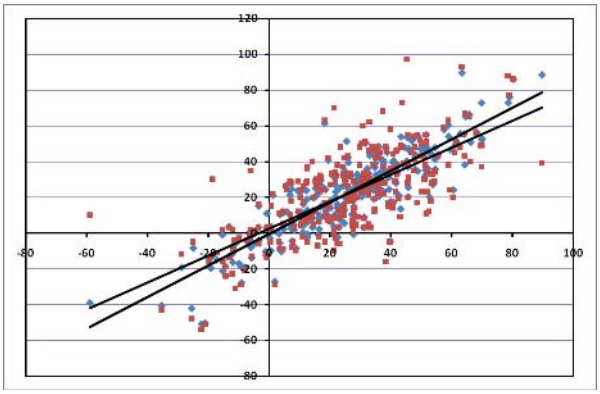

Figure 4. Regression for kg fat of 2/2008 MACE EBVs (blue) and from 2/2008 Italian EBVs (red) on 4/2004 MACE EBVs.

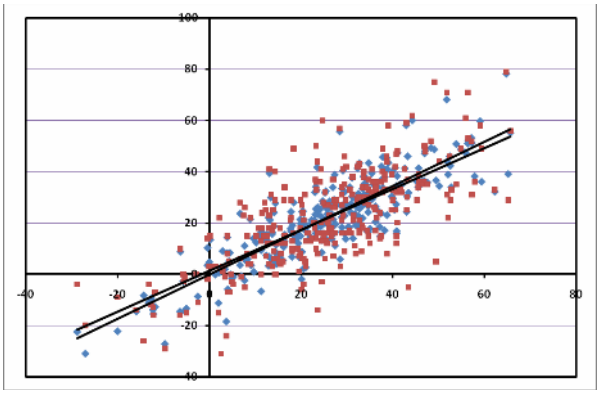

Figure 5. Regression for kg fat of 2/2008 MACE EBVs (blue) and from 2/2008 Italian EBVs (red) on 4/2004 MACE EBVs.

Correlation tables were calculated between MACE EBVs without Italian daughters and later MACE and Italian EBVs with Italian daughters as shown in Table 1.

Conclusions

MACE EBVS are good predictors of later MACE EBVs. The performance of MACE EBVs as predictors for later Italian EBVs is as expected a bit lower.

References

Brochard, M., Minery, S. & Mattalia, S. 2006. Accuracy of international evaluations in predicting French estimated breeding values of foreign Holstein bulls. *Interbull Bulletin 35*, 67-71.

McClintock, S., Beard, K. & Poole, R. 2003. Interbull proofs are a reasonably unbiased prediction of future performance in Australia for imported bulls. *Interbull Bulletin 31*, 169-170.

Powell, R.L., Norman, H.D. & Banos, G. 2000. Improving prediction of national evaluations by use of data from other countries. *J. Dairy Sci.83(2)*, 368.

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Table 1. Correlations of EBVs for production traits of import semen bulls. Upper triangle: Correlations of the last Interbull EBVs without Italian daughters with successive Interbull EBVs with Italian daughters. Each row represents a batch of bulls with their last Interbull evaluation without Italian daughters given in the first column. Each column then represents the correlations of that evaluation with the successive evaluations indicated in the header row. Lower triangle: Correlations of the last Interbull EBVs without Italian daughters with successive Italian EBVs. Each column represents a batch of bulls with their last Interbull evaluation without Italian daughters given in the header row. Each row then represents the correlations of that evaluation with the successive evaluations indicated in the first column. The last column and row give the number of bulls. Table 1A results for kg milk. Table 1B results for kg fat. Table 1C results for kg protein.

Table 1A. Correlations of EBVs for kg milk for import semen bulls.

	4/2004	**1/2005**	**2/2005**	**3/2005**	**4/2005**	**1/2006**	**2/2006**	**3/2006**	**4/2006**	**1/2007**	**2/2007**	**3/2007**	**1/2008**	**2/2008**	**N**
4/2004	1	0.986	0.927	0.932	0.889	0.902	0.914	0.917	0.909	0.904	0.904	0.898	0.888	0.886	**23**
1/2005	0.576	1	0.982	0.919	0.896	0.893	0.908	0.883	0.883	0.881	0.898	0.896	0.888	0.895	**32**
2/2005	0.731	0.539	1	0.976	0.967	0.878	0.888	0.855	0.846	0.852	0.855	0.854	0.866	0.870	**31**
3/2005	0.799	0.664	0.630	1	0.992	0.980	0.950	0.946	0.942	0.918	0.908	0.900	0.910	0.908	**13**
4/2005	0.734	0.729	0.623	0.832	1	0.986	0.960	0.950	0.937	0.934	0.941	0.946	0.940	0.945	**30**
1/2006	0.800	0.759	0.757	0.799	0.682	1	0.996	0.954	0.937	0.939	0.956	0.949	0.941	0.946	**24**
2/2006	0.821	0.814	0.814	0.802	0.705	0.652	1	0.973	0.959	0.951	0.937	0.925	0.926	0.930	**13**
3/2006	0.830	0.774	0.788	0.868	0.740	0.713	0.663	1	0.982	0.975	0.941	0.919	0.926	0.931	**16**
4/2006	0.837	0.779	0.771	0.873	0.749	0.750	0.806	0.673	1	0.992	0.971	0.935	0.920	0.916	**23**
1/2007	0.842	0.799	0.799	0.854	0.785	0.829	0.820	0.901	0.585	1	0.969	0.945	0.952	0.947	**26**
2/2007	0.851	0.788	0.807	0.859	0.802	0.903	0.788	0.873	0.633	0.528	1	0.990	0.968	0.950	**18**
3/2007	0.850	0.796	0.816	0.853	0.821	0.901	0.794	0.877	0.588	0.660	0.673	1	0.993	0.966	**26**
1/2008	0.848	0.790	0.838	0.859	0.815	0.882	0.782	0.855	0.553	0.625	0.835	0.747	1	0.987	**30**
2/2008	0.844	0.789	0.834	0.867	0.834	0.881	0.820	0.865	0.570	0.657	0.884	0.742	0.690	1	
N	**23**	**32**	**31**	**13**	**30**	**24**	**13**	**16**	**23**	**26**	**18**	**26**	**30**		

Table 1B. Correlations of EBVs for kg fat for import semen bulls.

	4/2004	1/2005	2/2005	3/2005	4/2005	1/2006	2/2006	3/2006	4/2006	1/2007	2/2007	3/2007	1/2008	2/2008	N
4/2004	1	0.985	0.859	0.858	0.820	0.848	0.862	0.866	0.878	0.868	0.877	0.862	0.863	0.867	**23**
1/2005	0.344	1	0.981	0.936	0.898	0.843	0.862	0.839	0.852	0.836	0.860	0.850	0.831	0.816	**32**
2/2005	0.522	0.477	1	0.985	0.961	0.837	0.845	0.831	0.795	0.815	0.814	0.797	0.815	0.806	**31**
3/2005	0.669	0.326	0.592	1	0.993	0.983	0.948	0.969	0.959	0.938	0.946	0.943	0.938	0.938	**13**
4/2005	0.651	0.384	0.578	0.887	1	0.983	0.952	0.909	0.867	0.853	0.877	0.883	0.871	0.872	**30**
1/2006	0.689	0.482	0.685	0.818	0.742	1	0.994	0.943	0.938	0.912	0.935	0.937	0.928	0.928	**24**
2/2006	0.699	0.569	0.706	0.826	0.658	0.758	1	0.957	0.934	0.896	0.883	0.870	0.850	0.854	**13**
3/2006	0.684	0.566	0.717	0.918	0.617	0.799	0.742	1	0.943	0.931	0.932	0.876	0.841	0.872	**16**
4/2006	0.710	0.587	0.709	0.915	0.580	0.767	0.824	0.249	1	0.992	0.964	0.946	0.941	0.931	**23**
1/2007	0.710	0.610	0.751	0.883	0.616	0.778	0.718	0.605	0.628	1	0.951	0.916	0.911	0.887	**26**
2/2007	0.708	0.627	0.774	0.905	0.677	0.855	0.764	0.798	0.771	0.593	1	0.985	0.961	0.954	**18**
3/2007	0.686	0.582	0.759	0.903	0.684	0.861	0.766	0.698	0.769	0.663	0.417	1	0.985	0.961	**26**
1/2008	0.713	0.589	0.783	0.891	0.683	0.838	0.679	0.682	0.782	0.724	0.523	0.737	1	0.964	**30**
2/2008	0.712	0.573	0.763	0.891	0.719	0.846	0.712	0.715	0.772	0.701	0.505	0.757	0.494	1	
N	**23**	**32**	**31**	**13**	**30**	**24**	**13**	**16**	**23**	**26**	**18**	**26**	**30**		

Table 1C. Correlations of EBVs for kg protein for import semen bulls.

	4/2004	1/2005	2/2005	3/2005	4/2005	1/2006	2/2006	3/2006	4/2006	1/2007	2/2007	3/2007	1/2008	2/2008	N
4/2004	1	0.985	0.907	0.903	0.859	0.886	0.903	0.901	0.904	0.902	0.903	0.892	0.881	0.883	**23**
1/2005	0.607	1	0.982	0.927	0.906	0.881	0.900	0.865	0.867	0.861	0.876	0.880	0.864	0.851	**32**
2/2005	0.693	0.494	1	0.965	0.946	0.850	0.866	0.825	0.813	0.827	0.828	0.821	0.836	0.845	**31**
3/2005	0.796	0.601	0.595	1	0.989	0.965	0.885	0.881	0.884	0.843	0.816	0.788	0.802	0.820	**13**
4/2005	0.739	0.719	0.577	0.631	1	0.969	0.914	0.880	0.852	0.860	0.881	0.881	0.870	0.879	**30**
1/2006	0.808	0.733	0.658	0.696	0.556	1	0.992	0.938	0.910	0.919	0.936	0.926	0.910	0.921	**24**
2/2006	0.824	0.790	0.743	0.570	0.503	0.615	1	0.984	0.968	0.940	0.940	0.937	0.933	0.938	**13**
3/2006	0.819	0.750	0.732	0.707	0.547	0.672	0.687	1	0.974	0.975	0.935	0.916	0.905	0.894	**16**
4/2006	0.847	0.761	0.717	0.746	0.585	0.700	0.821	0.593	1	0.987	0.961	0.954	0.937	0.927	**23**
1/2007	0.849	0.765	0.761	0.735	0.664	0.809	0.804	0.825	0.526	1	0.934	0.888	0.880	0.872	**26**
2/2007	0.849	0.734	0.779	0.713	0.695	0.882	0.815	0.835	0.650	0.432	1	0.983	0.954	0.940	**18**
3/2007	0.842	0.739	0.779	0.685	0.713	0.874	0.827	0.843	0.674	0.612	0.787	1	0.991	0.969	**26**
1/2008	0.838	0.734	0.797	0.685	0.693	0.838	0.801	0.830	0.657	0.580	0.796	0.616	1	0.969	**30**
2/2008	0.842	0.741	0.804	0.729	0.724	0.838	0.831	0.790	0.633	0.620	0.855	0.736	0.505	1	
N	**23**	**32**	**31**	**13**	**30**	**24**	**13**	**16**	**23**	**26**	**18**	**26**	**30**		