UDK 636.082;636.11

Izlaganje sa znanstvenog skupa
Conference paper

ESTIMATION OF BREEDING VALUES FOR SPORT HORSES IN GERMANY

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Abstract

Breeding values for jumping and dressage performance of sport horses are estimated in Germany by the VIT in cooperation with the "Deutsch Reiterliche Vereinigung" (FN) once a year. The estimation is based on jumping and dressage sport results of placed horses at German competitions since 1979. The datasets cover 3,199,399 jumping performances of 134,904 placed horses and 1,402,330 dressage performances of 89,063 horses. Breeding values are estimated separately for each trait by a repeatability animal model. Only the logarithmic transformed winnings of ranked horses within a competition can be used as observed performances, since there is no information available about not placed horses. Beside the genetic and permanent environmental effect of the animal the 1996 improved model considers the fixed of (age*sex), competition and rider. Riders having 20 or more placings with at least 2 different horses are incuded as own fixed effect class otherwise the rider is pooled within a (year*rider ability level) class. In the former model the rider effect was handled by a precorrection for the ability level of the rider, and instead of the single competition the complete event with different competition was used to account for that effect. With the present model we found lower heritabilties in both traits (h_2=0.10). In addition larger parts of the variation in the traits are explained by the environmental effects of competition and rider. Partly remarkable changes in the evaluation and ranking of old famous stallions between the former model (1995) and the present model (1996) can be observed. The ranking of young stallions remained very similar.

Introduction

In Germany breeding values of sport horses are estimated for the traits dressage and jumping. The original enaluation model was developed by Meinardus (1988) and applied by VIT since 1996 to data of sport horses placed in national competitions. Neglecting some marginal refinements of the

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Rad je priopćen na 48. Annual Meeting of the European Association for Animal Production (EAAP) Vienna, Austria, August 25-28,1997.

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estimation procedure during the last years two important changes of the estimation model were introduced in 1996, in order to have a more reliable separation of environmental and genetic effects. The rider effect which was handled as precorrection in the original model is now considered directly in the evaluation, and each single competition is chosen as subcell instead of the whole tournament with several different competitions.

The objective of the present proceeding is to describe and explain the actual evaluation model, to compare it with the previous model and to show possible future developments for the estimation procedure. This includes improvements of the data basis and the statistical model.

Material and Methods

All placings in national competitions since 1979 rewarded with monetary winnings are used as yield information. The data cover earnings in all different levels of competitions (A, L, M, S competitions). Placings of German horses in international events were excluded because of missing comparisons. The data structur in the trait jumping placings is desrcibed in the tables 1 and 2 separately for low and high level competitions.

The improved and actually applied evaluation model is

$$Y_{yijklm} = (A \bullet S)_i + C_j + R_k + a_l + p_l + e_{ijklm}$$

where

Y_{yijklm} is the logaritmic transformed winning of the placing

$(A \bullet S)_i$ is the i[th] fixed (age*sex) effect, (stallion, mare, gelding*6 age classes)

C_j is the fixed effect of the j[th] competition in which the winning was achieved,

R_k is the k[th] fixed rider effect, the classification is (rider*performance class of the rider), if there are at least 20 winnings achieved with at least 2 horses within that subcell, otherwise the classification is (year*performance class of the rider),

a_l is the random additive genetic effect of the l[th] horse (breeding value),

p_l is the random permanent environmental effect of the l[th] horse, which is influencing all performances similarily during its whole career (eg. conditions, accidents during rearing, training, housing, etc.), and

e_{ijklm} is the random residual effect.

The substantial improvements of the actual model compared to the former model are the distinct definition of each competition as smallest environmental subcell instead of the whole event with several competitions, and the refined and variable defined rider effect which was handled by precorrection in the former model.

Variance analysis with the same model applied on part datasets point out that heritabilities are in the range of 0.08 - 0.10 and repeatabilities in the range of 0.25 - 0.30 for the logarithmic winning in both traits. Therefore the a priori assumed genetic parameters are reduced from h^2=0.18 and c^2=0.45 in the former model to 0.10 and 0.30 in the actual model.

The lower genetic parameters and the direct consideration of the refined environmental classifications lead to a more conservative estimation of breeding values. In other words, less variation is assumed to be caused by genetic diferences between horses in the actual model. The reduction of the repeatability is increasing the relative importance of many placings of an horse.

Results and Discussion

Most horses, respectively most descendants of a stallion have their placings in low level competitions (see table 1). Less than 8 % of all jumping horses achieve placings in high level competitions (S). These 8 % of the best horses have in average more than 75 % of their placings in low level competitions (A, L, M). In total less than 5 % placings are in high level competitions. This means that low level placings have a significant majority in the data, what is reflected in the evaluation results, too. A correlation r=0.98 is found between proofs based on placings in all competions and proofs estimated solely on placings in low level competitions. Even in the case of low heritability and repeatabilty a few S-placings within many ALM-placings do not change significantly the breeding value of an horse with own performance or a stallion estimated via a few additionally S ranked descendants.

Table 1 - DATA STRUCTURE IN THE EVALUATION RUN FOR JUMPING PERFORMANCE IN 1996

	Jumping		
	ALM	S	Total
Total no. of horses			232,053
Horses with winnings	134,841	10,645	134,904
Placings with winnings	3,035409	163,891	3,199,300
Stallions (>4 desc. with winnings)	3,557	545	3,557
Competitions	288,019	18,067	306,086
Rider effects	118,811	5,750	119,056

Young horses are only starting in low level competitions (ALM). They don't have the chance of placings in high level competitions (S). Therefore their proofs and the proofs of young stallions are solely estimated on the base of ALM competitions. Thus the most important information for the selection of young stallions must be derivated from winnings in ALM competitions. The standard deviation of winnings in ALM competitions is very small, and subsequently the standard deviation of the estimated proofs, too. By transforming the estimated proof on a standardized publishing scale (see table 4) larger differences between stallions, as are estimated really, are pretended. In table 3 the ranges of the fixed effects and proof are displayed. The shown values are approximately backtransformed from the logarithmic estimation scale. Therefore the backtranformed estimates have skewed distributions. The genetic standard deviation is approximately 5 DM.

Table 2 - MEANS, STANDARD DEVIATIONS, MINIMUM AND MAXIMUM OF EARNINGS IN ALM AND S JUMPING COMPETITIONS

	Earnings (ALM)		Earnings (S)	
	DM	ln (DM)	DM	ln(DM)
Mean	54	3,55	532	3,90
Standsrd deviation	29	1,40	1496	0,80
Minimum	5	1,61	10	2,30
Maximum	7500	8,92	100000	11,50

Table 3 - APPROXIMATE STANDARD DEVIATION AND RANGE OF ESTIMATES IN THE EVALUATION FOR JUMPING PERFORMANCE IN 1966.

Effect	Std. Dev. (DM)	Range (DM)
Age * Sex	4	-5....+6
Rider	20	-170....+700
Competition	25	-300....+9500
Breeding Values (Stallions)	4	-15....+40

Table 4 - FORMULAS TO STANDARDIZE ESTIMATED PROOFS TO PUBLISHING SCALE

Data basis for estimation	No. of horses in the basis sample Mean* /Std. Dev.**	Standardisation formula
All competitions	6788/1206	ZW=100+(a+0,010)*20/0,045
ALM competitions	6786/1206	ZW=100+(a+0,011)*20/0,043
S competitions	583/49	ZW=100+(a-0,019)*20/0,062

*) The Mean of all estimation run born in 1988 is set to 100

**) The St. Dev. Of all stallions estimated with at least 75 % reliability is set to 12

The correlation between the results out of the complete estimation run (all winnings in all competitions) and the results solely on the base of high level competitions (S) is r=0.33. This value seems to be very low. Considering that this correlation is estimated between breeding values having an average reliability of R^2=0.80 in the complete run and R^2=0.60 using only winnings in S-competitions this value is in an expected plausible range and does not point out that the performance in low and high level competitions should be regarded as different genetic traits.

Conclusion

The improved present model evaluates stallions more reliable because of the refined classification of the fixed environmental effects (rider*rider ability class) and competitions. In the former model these effects were partly interpreted as genetic effects and therefore not adequately corrected. But as a consequence a reduced variation in proofs results.

As long as only highly selected data are available for the evaluation, only the conditional prediction "which horse is the best within the best ranked horses" is possible. Having all performances (placings) of all started horses in a competition available data are still selected, since different parts of progeny groups of stallions are appearing in jumping and dressage competitions. But the prediction is closer to the question we want to answer - which stallion sires the most successful sport horses.

In order to consider more correctly the genetic competition between low and high- competitions in the evaluation, information of all started horses is necessary. Since the yield deviations (positive and negative) in high prize competitions - despite lohgarithmic transformation - are very large comparable to low prize competitions, changing the observed trait from monetary winning to the rank corrected for the number of starters in the competition might improve also the correct consideration of the genetic competition (Tavernier, 1990).

The question "What's first - a successful horse or a successful rider" might be solved in a better way by including different (rider*horse) permanent effects into the model. In the present model it is difficult to validate wether the rider effect is biased.

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PROCJENA UZGOJNIH VRIJEDNOSTI ŠPORTSKIH KONJA U NJEMAČKOJ

Sažetak

U Njemačkoj jednom godišnje "Vereinigte" Information - systeme Tierhaltung/VIT / u suradnji s "Deutsch Reiterliche Vereinigung" /FN/ procjenjuje uzgojne vrijednosti za performansu /uspjehe/ športskih konja u skakanju i dresuri. Procjena se temelji na športskim rezultatima u skakanju i dresuri konja koji su dijelili prva tri mjesta na njemačkim natjecanjima od 1979. Skupovi podataka pokrivaju 3,199.399 rezultata u skokovima i to 134.904 konja sa prvih triju mjesta i 1,402.330 rezultata u dresuri i to od 89.063 konja. Uzgojne se vrijednosti procjenjuju odvojeno za svako svojstvo pomoću modela ponovljivosti životinje. Kao utvrđeni uspjesi mogu se upotrijebiti samo logaritamski pretvorene pobjede konja rangiranih unutar jednog natjecanja, budući da nema raspoloživih podataka o konjima koji nisu zauzeli prva tri mjesta. Osim genetskog i stalnog učinka okoliša te životinja,usavršeni model iz 1996. uzima u obzir utvrđene učinke (dob*spol), natjecanje i jahača. Jahači koji imaju 20 ili više prvih triju mjesta sa barem 2 različita konja ubrajaju se kao samostalan razred utvrđenog učinka. Inače se jahač svrstava unutar (godina*razina jahačeve sposobnosti) nekog razreda. U prijašnjem se modelu učinak jahača prikazivao pomoću prethodne korekcije za razinu sposobnosti jahača, a umjesto pojedinog natjecanja primjenjivalo se cjelokupno /trodnevno/ natjecanje s različitim natjecanjima kao obrazloženje tog učinka. Sa sadašnjim smo modelom našli nižu nasljednost oba svojstva /h^2-0.10/. Uz to veći dijelovi varijacije svojstava tumače se učincima okoliša natjecanja i jahača. Mogu se zapaziti djelommično značajne promjene u procjeni i rangiranju starijih glasovitih pastuha između prijašnjih modela (1995) i sadašnjeg modela /1996/. Rangiranje je mladih pastuha ostalo vrlo slično.

Primljeno: 20. 11. 1997.