

( )

\*

( / / : // : )

.

.

/

.

/ /

/ /

(p < / )

.

/

.

/ /

.

/

( , , )

( )  
( )

- 
1. Functional Productive Life
  2. True Productive Life

( )

)

( , , , )

(

( )

( , )

(t )

( )

( )

( , , , )

/ /

/ /

( , , , , )

( )

( )

3. Proportional Hazards Models

4. Cox

5. Weibull

6. Baseline Hazard Function

1 .Censored Data

2 .Survival Analysis

( )

( )

---

/ ± /	( )
/ ± /	( )
	( )
	( )
	( )
	( )

---

$$h_{ijklmnp}(t) = h_0(t) \exp[hys_i(t) + p_j(t_1, t_2) + AFC_k + m_l(t) + hf_m + s_n + 0.5mgs_p] \quad (1)$$

$$h_0(t) = h_{ijklmnp}(t) \exp[-hys_i(t) - p_j(t_1, t_2) - AFC_k - m_l(t) - hf_m - s_n - 0.5mgs_p] \quad (2)$$

$$p_j(t_1, t_2) = \dots$$

$$h_{\log}^2 = \frac{4\sigma_s^2}{\sigma_s^2 + \psi^{(1)}(\gamma) + \frac{\pi^2}{6}}$$

$$\sigma_s^2 \psi^{(1)}(\gamma)$$

$\gamma$

k

$AFC_k$

( )

:

l

$m_l(t)$

( , )

)

(

$$h_{orig}^2 = \left[ \exp\left(\frac{\nu}{\rho}\right) \right]^{-2} h_{\log}^2$$

(

$\nu = digamma(\gamma) - \ln(\gamma) - \text{Euler's constant}$

:

$\rho$

l

l

l l

l

l

l l

l

(p<0.01)

l

)

k  $hf_k$

(

$mgs_p S_n$

$A\sigma_s^2$

$\sigma_s^2$

A

( ) Survival Kit

( , )

...

:

$\rho$

( )

/

/

( )

/

)

( , , , )

(

( )

( )

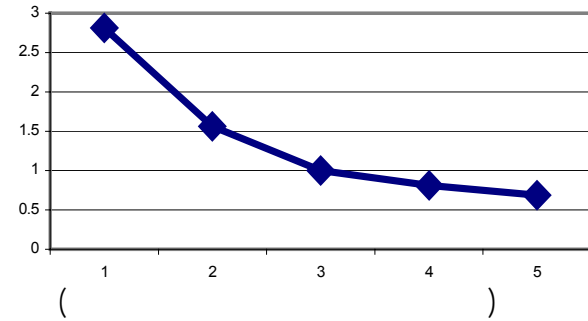
( )

( , )

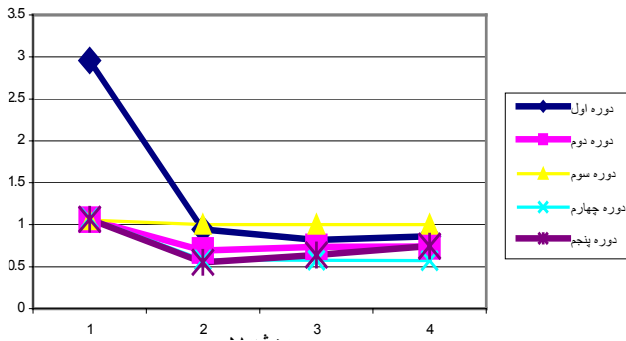
(

/ /  
/ /

( , , , )



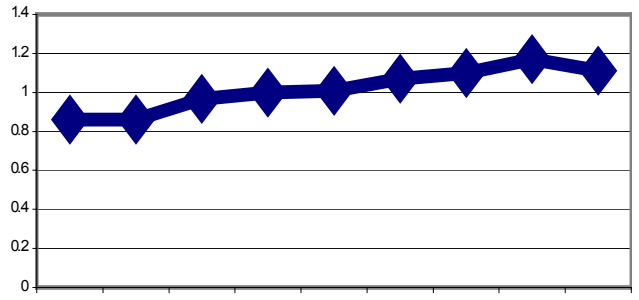
( )



( )

( , )

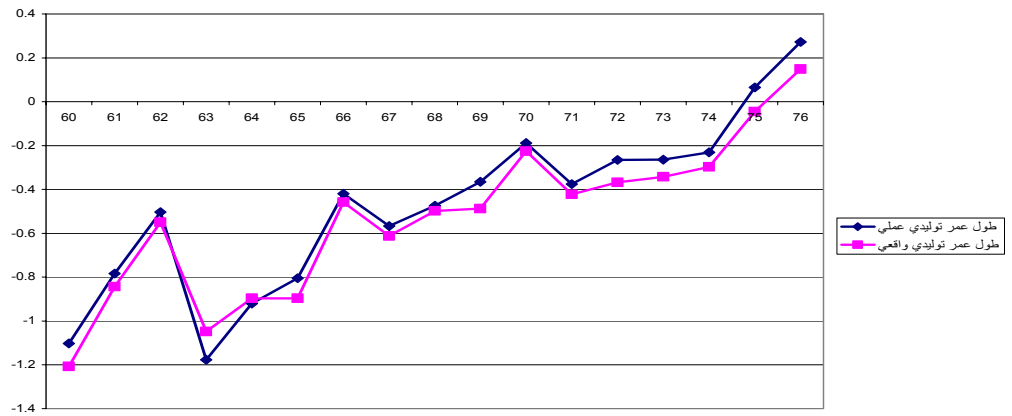
( , , , )



/	/	$\rho$
/	/	$\gamma$
/	/	
/	/	
/	/	
/	/	

( )

1. Transmitting Ability



## Survival Kit

### REFERENCES

1. Boettcher, P. J., L. K. Jairath & J. C. M. Dekkers. 1999. Comparison of methods for genetic evaluation of sires for survival of their daughters in the first three lactations. *J. Dairy Sci.* 82:1034-1044.
2. Caraviello, D. Z., K. A. Weigel & D. Gianola. 2004. Comparison between a weibull proportional hazards model and linear model for predicting the genetic merit of US Jersey sires for daughter longevity. *J. Dairy Sci.* 87: 1469-1476.
3. Caraviello, D. Z., K. A. Weigel & D. Gianola. 2004. Prediction of longevity breeding value for US Holstein sires using survival analysis methodology. *J. Dairy Sci.* 87:3518-3525.
4. Chirinos, Z., M. J. Carabano & D. Hernandez. 2002. Longevity analysis in Spanish Holstein-Friesian cattle. 7<sup>th</sup> W. Cong. Genet. Appl. Livest. Prod. Montpellier, France, No. 1-72.
5. Ducrocq, V., 1997. Survival analysis, a statistical tool for longevity data. 48<sup>th</sup> Annual Meeting of the European Association for Animal Production. 25-28 August, Viena, Austria.
6. Ducrocq, V. 1999. Two years of experience with the French genetic evaluation of dairy bulls on production adjusted longevity of their daughters. Proc. Int. Workshop on EU Concerted Action Genetic Improvement of Functional Traits in Cattle (GIFT); Longevity, Jouy-en-Josas, France. *Interbull Bulletin*, Uppsala, Sweden.21:60-70.
7. Ducrocq, V., & G. Casella. 1996. A Bayesian analysis of mixed survival models. *Genet. Sel. Evol.* 28: 505-529.
8. Ducrocq, V. & J. Solkner. 1998. Implementation of a routine breeding value evaluation for longevity of dairy cows using survival analysis techniques. Proc. 6<sup>th</sup> World Cong. Genet. Applied to Livestock Production, Armidale, Australia, Vol. 23: 359-362.
9. Ducrocq, V. & J. Solkner. 1998. "The survival Kit-V3.0" A package for large analysis of survival data. Proc. 6<sup>th</sup> World Cong. Genet. Appl. Livest. Prod., Armidale, NSW, Australia. 27:447-448.
10. Ducrocq, V., R. L. Quaas, E. J. Pollak, & G. Casella. 1988. Length of productive life of dairy cows. II. Variance component estimation and sire evaluation. *J. Dairy Sci.* 71:3071-3079.

11. Roxsrom, A., V. Ducrocq & E. Strandberg. 2003. Survival analysis of longevity in dairy cattle on a lactation basis. *Genet. Sel. Evol.* 35:305-318.
12. Settar, P. & J. I. Weller. 1999. Genetic analysis of cow survival in the Israeli dairy cattle population. *J. Dairy Sci.* 82:2170–2177
13. Sewlem, A. & G. Kistemaker. Genetic analysis of herd life in Canadian dairy cattle using the survival kit. [Http://www.cdn.ca/commits.apr2003/survival.kit. pdf](http://www.cdn.ca/commits.apr2003/survival.kit.pdf). Accessed June 2003.
14. Strandberg, E. 1996. Breeding for longevity in dairy cows. P. 125 in: *Progress in Dairy Science*. CAB Int., Wallingford, Oxon, United Kingdom.
15. Van der Linde, C. & G. D. Jong. 2003. MACE for longevity traits. *Proc. Interbull Technical Workshop*. Beltsville, MD, USA, March 2-3. pp. 20-24.
16. Visscher, P., R. Thompson, H. Yazdi, W. G. Hill, & S. Brotherstone. 1999. Genetic analysis of longevity data in the UK: Present practice and considerations for the future. *Proc. Int. Workshop on EU Concerted Action Genetic Improvement of Functional Traits in Cattle (GIFT); Longevity*, Jouy-en-Josas, France. *Interbull Bulletin*, 21:16-22.
17. Vollema, A. R. & A. F. Groen. 1998. A comparison of breeding value predictors for longevity using a linear model and survival analysis. *J Dairy Sci* 81:3315–3320.
18. Vollema, A. R., S. Van Der Beek, A. G. F. Harbers, & G. De Jong. 2000. Genetic evaluation for longevity of Dutch dairy bulls. *J. Dairy Sci.* 83:2629-2639.
19. Vukasinovic, N. 1999. Application of survival analysis in breeding for longevity. *Proc. Int. Workshop on EU Concerted Action Genetic Improvement of Functional Traits in Cattle (GIFT); Longevity*, Jouy-en-Josas, France. *Interbull Bulletin*, 21:3-10
20. Vukasinovic, N., J. Moll & L. Casanova. 2001. Implementation of a routine genetic evaluation for longevity based on survival analysis techniques in dairy cattle populations in Switzerland. *J. Dairy Sci.* 84:2073-2080
21. Yazdi, M. H., P. M. Visscher, V. Ducrocq & R Thompson. 2002. Heritability, reliability of genetic evaluations and response to selection in proportional hazard models. *J. Dairy Sci.* 85:1563-1577.