BIVARIATE FRAILTY MODELS: A REVIEW

Dimitar Atanasov*

SUMMARY *The most popular Bivariate Frailty Modles are The Correlated Frailty and The Shared Frailty Models. As the Shared Frailty Model does not satisfy some natural conditions, the Correlated Frailty Model is proposed. These two models are closely related although they are bases on different concepts.*

Here the Bivariate Survival analysis and Shared Frailty model are presented, Correlated Frailty is considered as well as the bivariate censoring and truncation problem are derived.

1. INTRODUCTION   The Correlated Frailty Model, as an extention of The Shared Frailty Models (Vaupel and Yashin, 1985), is considered in Yashin and Iachine (1999). During the last decade this model gained popularity in studying the hazard models and the causes of death in population of related individuals. Galton (1875) was the first to point out that bivariate data on twins are very useful in tackling problems of this kind. In particular, the relationship between the lifespan of monozigotc and dizigotic twins may be different due to genetic reasons (Yashin, Vapuerl and Iachine, 1995). If one has an appropriate bivariate survival model, one can clarify the role of genetic factors in the aging process.

One of the first researches on the bivariate survival models is random-effect model (Clayton, 1978), in which the notion of shared frailty risk is introduced. Many modiffications of this model exist, as various distributions of the frailty parameter can be used. Hougard (1986) proposed random - effect models with bivariate Weibull distribution, as well as Shared Frailty Model with positive stable distribution (Hougard, 1987). Dabrowska (1990) develops a bivariate Kaplan - Mayer estimate and discusses some problems on the multivariate survival analysis.

Yashin et al (1993) states that the Shared Frailty Model does not meet some natural requirements. Yashin et al. (1995) developed a new generalization of the Frailty Model that is used in demographical applications. The so called Correlated Frailty Model is closely related to the Shared Frailty Model, although the two models are based on different concepts.

---

* Senior Assistant at the Department of Mathematics and Informatics of the University of Sofia "St. Kliment Ochridsky", Sofia; e-mail: datanasov@fmi.uni-sofia.bg .