

Due to the need of studying the theoretical property of variable selection procedures for Cox's model, we study the asymptotic behavior of partial likelihood for the Cox model. We find that the partial likelihood does not behave like an ordinary likelihood, whose sample average typically tends to its expected value, a finite number, in probability. Under some mild conditions, we prove that the sample average of partial likelihood tends to infinity at the rate of logarithm of the sample size in probability. This is an interesting and surprising results because the maximum partial likelihood estimate has the same asymptotical behavior as the ordinal maximum likelihood estimate. We further apply the asymptotic results on the partial likelihood to study tuning parameter selection for penalized partial likelihood. Our finding indicates that the penalized partial likelihood with the generalized cross-validation (GCV) tuning parameter proposed in Fan and Li (2002) enjoys the model selection consistency property. This is another surprising result because it is well known that the GCV, AIC and C_p are all equivalent in the context for linear regression models, and are not model selection consistent. Our empirical studies via Monte Carlo simulation and real data example confirms our theoretical findings.