# Abstract

In decision theory, when several parameters need to be estimated simultaneously, many standard estimators can be improved, in terms of a combined loss function. The problem of finding such estimators has been well studied in the literature, but mostly under parametric settings, which is inappropriate for heavy-tailed distributions. In the first part of this dissertation, a robust simultaneous estimator of location is proposed using the shrinkage idea. A nonparametric Bayesian estimator is also discussed as an alternative. The proposed estimators do not assume a specific parametric distribution and they do not require the existence of finite moments. The performance of proposed estimators are examined in simulation studies and financial data applications. In the second part, we extend the idea of simultaneous estimation in the context of estimating system reliability when component data are observed. We propose an improved estimator of system reliability by using shrinkage estimators for each of the component reliabilities and then utilize the structure function to combine these estimators to obtain the system reliability estimator. The approach is general since the shrinkage is not on the estimated parameters of component reliability functions, but is instead on the estimated component hazard functions, and are therefore extendable to the nonparametric setting. The details in nonparametric setting are discussed in a later chapter. Simulation results are presented to examine the performances of the proposed estimator.