Laguerre deconvolution when the nuisance process has unknown distribution

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Abstract. *We consider a model where Z_i is observed for $i = 1, \dots, n$ with $Z_i = X_i + Y_i$, the sum of two independent nonnegative random variables X_i and Y_i. The three samples $(X_i)_{1\leq i\leq n}$, $(Y_i)_{1\leq i\leq n}$, $(Z_i)_{1\leq i\leq n}$ are independent and identically distributed, with densities denoted by f, g, h. The aim of the work is to estimate the density f of the unobserved X_i's. As all random variables are nonnegative, we can use the Laguerre basis to build projection estimators of f, relying on projection estimators of h. When g is known, the estimation problem has been studied in Mabon (2015). In this work, we study the case where g is unknown but an additional sample Y_i' for $i = 1, \dots, n_0$ is available, and we study to what extent the results can be generalized. This problem requires the estimation of a matrix and the study of the deviation of the inverse of the estimated matrix with respect to the true inverse. We provide a bound for the mean square-risk of the estimator depending on both n and n_0, and we compute rates of convergence on Sobolev Laguerre spaces. We build a procedure of model selection which is proved to result in an adequate bias-variance trade-off. The implementation proves that the procedure is fast and numerically satisfactory.*