# On F-modeling based Empirical Bayes Estimation of Variances

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May 28, 2021

**Abstract**

We consider the problem of empirical Bayes estimation of multiple variances $\sigma_i^2$'s when provided with sample variances $s_i^2$'s. Assuming an arbitrary prior on $\sigma_i^2$'s, we derive different versions of the Bayes estimators using different loss functions. For one particular loss function, the resultant Bayes estimator relies on $F(s^2)$, the marginal cumulative distribution function of the sample variances only. When replacing it with the empirical distribution function $F_N(s^2)$, we obtain an empirical Bayes version called **F**-modeling based **E**mpirical **B**ayes estimator of **V**ariances (F-EBV). It is shown theoretically that F-EBV converges to the corresponding Bayes version *uniformly* over a large set. It can be used for post-selection estimation and the *finite Bayes* inference problem. We have demonstrated the advantages of F-EBV through extensive simulations and real data analysis.

**Keywords: uniform convergence, empirical distribution function, selective inference.**