Chapter 6
Concluding Remarks and Future Directions

“End is really not the end; it creates the necessary foundation for new beginning”

- Anonymous

We have considered the ultrastructural measurement error model which has functional and structural regression models as its special cases. No assumptions about the distributions of measurement errors and other random components in the model except the finiteness of first four moments have been made. It is assumed that the prior information regarding regression coefficients is available in the form of

(i) exact linear restrictions;
(ii) stochastic linear restrictions.

We first assumed that replicated observations are available for the response and the explanatory variables and introduced the replicated ultrastructural measurement error (RUME) multiple regression model. Several consistent estimators of the regression coefficients incorporating the prior information have been proposed.

Using Stein’s methodology, a general framework is developed for improving upon the existing estimators with respect to the quadratic risk. Using this framework, improved unrestricted and restricted estimators of the regression coefficients have been proposed for the RUME model.

The asymptotic normality of these estimators has been established without assuming any specific distributional form of any random component in the model. It is found that the estimators are asymptotically unbiased. Simulations suggest that the
estimators which incorporate the prior information are better than those not using prior information. It is observed that non-normality does not have much effect on the properties of the estimators. The proposed estimators are illustrated using a real economic data set.

We have also tackled the situation when more than one correlated response variables are present in the study, by defining the multivariate ultrastructural measurement error (MUME) regression model. To find consistent estimators of the regression coefficients matrix, it is assumed that the reliability matrix of the explanatory variables is available. The consistent estimators making use of the exact linear restrictions are proposed. It is found that the proposed estimators asymptotically follow Matrix Normal distribution and are asymptotically unbiased.

In this thesis, we considered the prior information in the form of exact and stochastic linear restrictions. One may think of using prior information in the form of inequalities for consistent estimation of the regression coefficients (refer Rao et al. (2008) for details). The general framework for obtaining the Stein-rule estimators can be extended to other situations as well. The restricted estimators proposed may also be used along with preliminary test estimation. One may also work on providing consistent estimators of the regression coefficient matrix in MUME model when prior information is available in the form of stochastic linear restrictions.