

This thesis is focused on local polynomial smoothers of the conditional variance function in a heteroscedastic nonparametric regression model. Both mean and variance functions are assumed to be smooth, but neither is assumed to be in a parametric family. The basic idea is to apply a local linear regression to squared residuals. This method, as we have shown, has high minimax efficiency and it is fully adaptive to the unknown conditional mean function. However, the local linear estimator may give negative values in finite samples which makes variance estimation impossible. Hence Xu and Phillips proposed a new variance estimator that is asymptotically equivalent to the local linear estimator for interior points but is guaranteed to be non-negative. We also established asymptotic results of both estimators for boundary points and proved better asymptotic behavior of the local linear estimator. That motivated us to propose a modification of the local linear estimator that guarantees non-negativity. Finally, simulations are conducted to evaluate the finite sample performances of the mentioned estimators.