

Unchalee Tonggumnead 2011: Test Statistics for Comparison of Nonparametric Regression Functions. Doctor of Philosophy (Statistics), Major Field: Statistics, Department of Statistics. Thesis Advisor: Mrs. Umpai Thongteeraparp, Ph.D. 158 pages.

The purpose of this study is to construct the test statistics for testing the equality of  $k$  regression function, and to study about the distribution of the test statistics under the null hypothesis ( $H_0$ ) and alternative hypothesis ( $H_1$ ). The hypothesis is as follows :

$H_0: m_1 = m_2 = m_3 = \dots = m_k$  vs  $H_1: m_i \neq m_j$ , for some  $i \neq j$ ,  $i, j \in \{1, \dots, k\}$ ,  $k \geq 2$ .  $m_j$  is non – parametric regression function, the model is as follows :

$Y_{ij} = m_j(X_{ij}) + \sigma_j(X_{ij})\varepsilon_{ij}$ ,  $i = 1, \dots, n_j, j = 1, \dots, k$ ,  $m_j(X_{ij}) = E(Y_{ij}|X_{ij})$  is non – parametric regression function that estimate from Nadaraya – Watson Estimator (NW),  $\sigma_j^2(X_{ij}) = \text{Var}(Y_{ij}|X_{ij})$  is the conditional variance, and  $\varepsilon_{ij}$  is the error variable. The critical values of the test statistics can be approximated by bootstrap procedure. In addition, the power of the test and controlling the probability of type I error present in the case of small sample sizes ( $n = 20$ ), moderate sample sizes ( $n = 50$ ), large sample sizes ( $n = 100$ ) and specify the shift function of independent variable  $X$  under the alternative hypothesis in three types: Constant Shift, Affine Shift and Quadratic Shift.

The result findings were as follows: The test statistics  $U_{KS}^1, U_{KU}^1, U_{KS}^2, U_{KU}^2$  are the function of  $U_j(y) = f_{ej}(y)p_j \sum_{r=1}^k \sum_{i=1}^{n_r} \frac{Y_{ir} - m(X_{ir})}{\sigma_j(X_{ir})} \left( \frac{f_j(X_{ir})}{f_{mix}(X_{ir})} - \frac{I(r=j)}{p_j} \right)$ ,

$j = 1, \dots, k$ ,  $-\infty < y < \infty$ , and  $U_j(y)$  have normal distribution. In addition, power of the test base on  $U_{KS}^1, U_{KU}^1, U_{KS}^2, U_{KU}^2$  performed best for the large sample size, and mostly these four test statistics could control the probability of type I error in all situations for the large sample size.

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Thesis Advisor's signature