# Time Domain BRS Estimation: Least Squares versus Quantile Regression

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The estimation of baroreflex sensitivity (BRS) has been shown useful in the study of cardiac-pathological states, with lower BRS values associated with increased dysfunction. BRS is quantified from the joint analysis of systolic blood pressure (SBP) and RR intervals and it can be estimated by the ordinary least squares (OLS) slope between SBP and RR values in baroreflex events. Using OLS, the linear relation between two variables is described by the conditional mean. Quantile regression (QR) provides a more robust slope estimate, using the conditional median. Additionally, QR is able to provide different slope estimates B(tau), $0<tau<1$, by simply considering other quantile values besides the median (tau = 0.50). The aim of this work is to investigate if QR is able to provide new insights into BRS characterization.

OLS and QR estimation procedures are applied to the 46 EuroBaVar records (23 paired records in Lying and Standing positions). In 7/46 records, B(OLS) and B(0.50) exhibit significant differences (Wald test, $p<0.05$). In these records, few but influent SBP-RR pairs (associated with the highest SBP and RR values) lead to B(OLS)>B(0.50). In respectively 4/46 and 6/46 records, B(0.25) = B(0.50) = B(0.75) and B(0.05) = B(0.25) = B(0.50) = B(0.75) = B(0.95) were rejected ($p<0.05$), indicating that for most records the SBP and RR dispersion around the median line is fairly symmetric. Regarding L and S discrimination, it is expected that $R>1$, with R being the L to S ratio of B. Similarly to R(OLS) also R(0.25), R(0.5) and R(0.75) distinguish L from S in all the 23 paired records. Finally, R(0.5)>R(OLS) in 15/23 cases.

In conclusion, for most recordings the EuroBaVar slopes at other quantiles besides 0.5 do not provide different information. However, B(0.50) is more robust than B(OLS) to influent SBP-RR pairs and therefore QR may provide a more adequate BRS estimate.