Hydrol. Earth Syst. Sci. Discuss., 7, C2330–C2332, 2010
www.hydrol-earth-syst-sci-discuss.net/7/C2330/2010/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimation of predictive hydrological uncertainty using quantile regression: examples from the national flood forecasting system (England and Wales)" *by* A. H. Weerts et al.

R. Koenker (Referee)

roger@ysidro.econ.uiuc.edu

Received and published: 16 September 2010

This paper describes a new approach to assessing the uncertainty of flood forecasts based on quantile regression methods. Since I am not familiar with the hydrology literature, I found it initially strange to be doing forecast evaluation by conditioning observed levels $s(t)$ on predicted levels, $\hat{s}(t)$. (I'm used to *generating* forecasts conditional on prior observables.) But having once overcome this disciplinary obstacle, and realized that this was really a forecast evaluation exercise, it began to make more sense.

It is a common belief in many application areas of statistics that *after transformation* some form of Gaussian error model is an adequate approximation. In regression settings choice of a suitable transformation is, however, often a challenging problem. Figures 2 and 3 illustrate that achieving homogeneity of dispersion can be quite problematic in the present application. Indeed, after transformation (Fig 2) the scatter plots appear less homoscedastic and more skewed than those without transformation (Fig 3). In such circumstances it is tempting, if only as a preliminary exploratory strategy, to consider some flexible specifications. One such strategy is to estimate conditional quantile functions that don't rely on global models and homogeneous dispersion and shape assumptions on the error distribution.

This seems especially pertinent in forecasting applications where the a priori choice of a class of appropriate transformations is unclear and shape of the conditional distributions is of independent interest. Even the centering of the flood forecast would seem to be questionable since asymmetric costs of over and under prediction would suggest that forecasters may choose to bias forecasts against the more costly error.

My main criticism of the paper is that it is insufficiently clear about how the estimation and plotting was carried out. In Figure 2, for example, it would be useful to know more about how the piecewise linear curves were estimated – all apparently have break in the slope at the same ordinate. How was this value selected? And why are the corresponding curves in Fig 3 rougher? It is not surprising that there is some crossing at the lowest water levels, since the data is quite sparse in these regions as is especially evident in Figure 2, where the quantile curves appear somewhat quixotic.

I found Figures 4-7 also somewhat obscure, both because the plotting of the grey bands was difficult to distinguish and because the precise model underlying their construction was never laid out. I was pleased to see that some systematic software development was underway, but I would strongly urge the authors to make these developments publicly available.

In summary, I believe that the methods described here may offer a useful complement to existing forecast evaluation methodology, and I would favor publication of the paper after some revision to elucidate the details of the methods more completely.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5547, 2010.