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Interactive comment on "Technical note: Inherent benchmark or not? Comparing Nash-Sutcliffe and Kling-Gupta efficiency scores" *by* Wouter J. M. Knoben et al.

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Received and published: 11 July 2019

Equating the NSE and KGE scores

The authors raise an interesting question of whether or not the mean observed flow is an inherent benchmark of the NSE and KGE criteria.

The mean flow is a base value intended by Nash and Sutcliffe (1970) to scale their NSE score to between 0 and 1. Corresponding KGE scores are -0.41 and 1 (Page 3,

Line 10). Rescaling the KGE criterion to (KGE+0.41)/1.41 would produce a 0 to 1 scale.

While worth searching for "a single perfect (hydrologic) model performance metric" (Page 4, Line 10), equally important if not more, in my opinion, is finding an alternate "starter" model to the mean flow one, the "no model" one in NSE. This will be a new benchmark or baseline against which the performances of other hydrologic models are to be measured.

One of the "least skill(ful)" ones is a one–step linear extrapolation model of the observed flows. The predicted or forecast flow by extrapolation is: $Q_{fore}(t) = Q_{obs}(t-1) + [Q_{obs}(t-1) - Q_{obs}(t-2)]$. This is a simplest autoregressive model of order 2. It has been used on its own, i.e., outside the NSE, as a river forecast model.

The NSE criterion may be modified by substituting the mean observed flow term, $\overline{Q_{obs}}$, in Equation (1), by the forecast flow. See Mizukami et al. (2019) cited by the authors for my previous comment on this (SC1 therein), the deficiency of the extrapolation model included.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-327, 2019.