Comments on "An Application of Model Output Statistics to Forecasting Quantitative Precipitation"

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Bermowitz (1975) has, in effect, provided evidence that essentially no skill relative to climatology existed in quantitative precipitation forecasting (QPF) in the United States in 1972. That is, neither the statistical PoPA forecasts (however maximized), nor the subjective forecasts prepared at the National Meteorological Center, nor the dynamical forecasts obtained from the LFM model scored as much as 1% better than climatological forecasts no matter what measure of goodness was applied and despite the short range (12–24 h) of the forecast.

The purpose of this communication is to provide evidence that QPF skill is alive (although not entirely well) at Boston in 1974–75. In the MIT forecasting activity described by Sanders (1973), the content of the P forecasts was changed starting with the fall 1974 contest. The revised version is a quantative precipitation forecast, by category, for the first, second, third and fourth 24 h period ahead. Category 1 means precipitation 0.01–0.05 inch, 2 means 0.06–0.10 inch, 20 means 0.96–1.00 inch, etc. The forecast is a conditional one; that is, it is scored only if measureable precipitation occurs.

The scoring rule is that the number of error points E is given by

$$E = |F - O|,$$

where F and O are the forecast and observed categories, respectively. The appropriate climatological control forecast is M, the monthly median category on days when precipitation occurs, which varies from 3 to 4 from month to month. The error of this control forecast is given by

$$C = |M - O|.$$

The skill of the forecasts is defined to be the percentage by which the sum of the error points for the daily forecasts is smaller than the sum of the error points for the control forecasts. The results are given in Table 1. Except for the third and fourth days ahead, a modest degree of skill seems to exist. We find useful guidance in the corresponding 24 h QPF derived from the PE numerical prediction model, although the forecasts, used objectively and without modification in our system, have been markedly inferior to climatological forecasts (except during the most recent season). We subjectively correct for the well-known slow bias, and for spurious-looking low forecast relative humidities in the model boundary layer when the predicted low-level flow is from an oceanic sector (as is often the case with the approach of storms).

We believe that comparable skill would have been demonstrated in 1972 had we been making quantitative precipitation forecasts then, because our consensus skill in the unchanged PP forecasts has been about the same recently as in previous years. The recent data appear in Table 2. As described by Sanders (1973), these forecasts represent probability distributions over a set of categories of precipitation amount, including zero, with limits adjusted so that the frequency of occurrence of the others is about equal. The larger and more persistent skill shown in Table 2, compared to Table 1, is probably

TABLE 1. Skill of consensus QPF forecasts relative to climatological control, with the number of forecasts in parentheses.

Season	Range 24 h	48 h	72 h	96 h
Fall 1975[1]	22 (27)	25 (27)	8 (31)	1 (33)
Summer 1975	6 (17)	1 (16)	−1 (16)	−3 (19)
Spring 1975	23 (31)	8 (36)	9 (34)	5 (35)
Fall 1974	24 (28)	9 (26)	−4 (23)	−3 (26)

[1] Through 31 December. "Fall" ends during the first week in February.

TABLE 2. Skill of consensus PP forecasts relative to climatological control with the number of forecasts in parentheses.

Season	Range 24 h	48 h	72 h	96 h
Fall 1975	54 (76)	36 (75)	16 (75)	3 (75)
Summer 1975	43 (59)	4 (59)	−1 (58)	−4 (58)
Spring 1975	57 (84)	18 (84)	8 (83)	−0 (82)
Fall 1974	49 (88)	26 (88)	14 (88)	0 (88)

due mainly to our ability to distinguish days in which no measureable precipitation falls, rather than to distinguish between amounts.

For the first day ahead, we find considerable value in the most recent precipitation amounts observed upstream, and in a broad view of the most recent radar information. As reported by Bermowitz, predictors of this type were not subjected to the screening regression procedure. It seems to me that statistical forecasts thus based ought to show some skill.

REFERENCES

Bermowitz, R. J., 1975: An application of model output statistics to forecasting quantitative precipitation. *Mon. Wea. Rev.*, **103**, 149–153.

Sanders, F., 1973: Skill in forecasting daily temperature and precipitation: Some experimental results. *Bull. Amer. Meteor. Soc.*, **54**, 1171–1179.