EPS use in energy demand prediction

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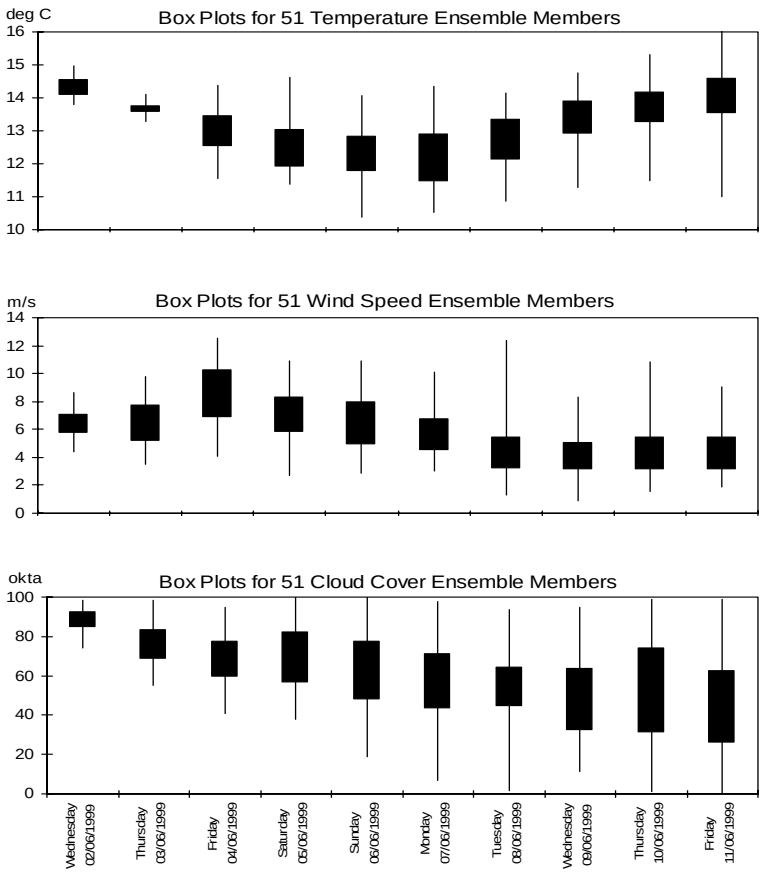
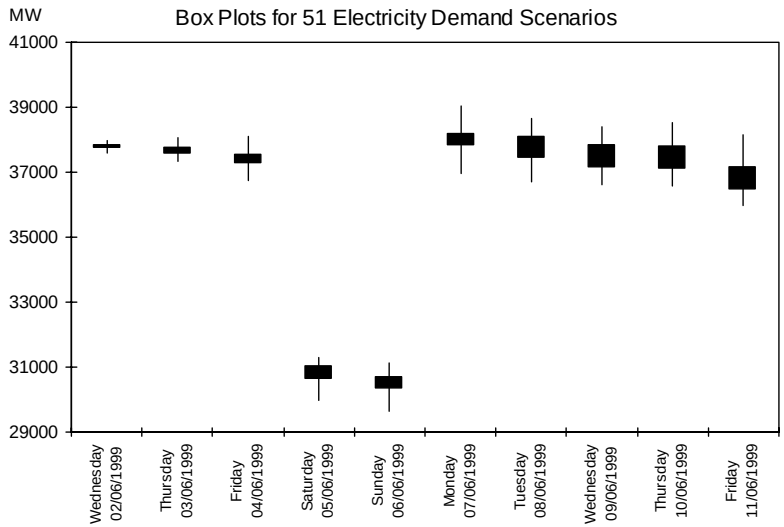
Using Ensembles in Demand Forecasting

Using the 51 ensemble members for each weather variable, we created 51 scenarios for energy demand

Taylor & Buizza (2001, Int. J. For., in press)

From EPS weather forecasts to energy-demand scenarios

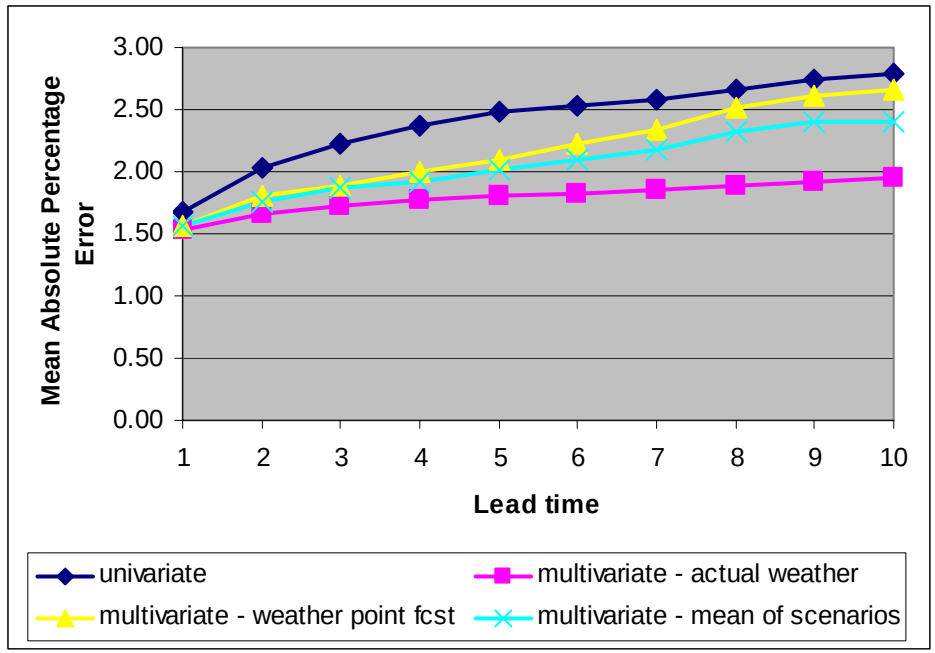




Taylor & Buizza (2001, Int. J. For., in press)

Forecast accuracy

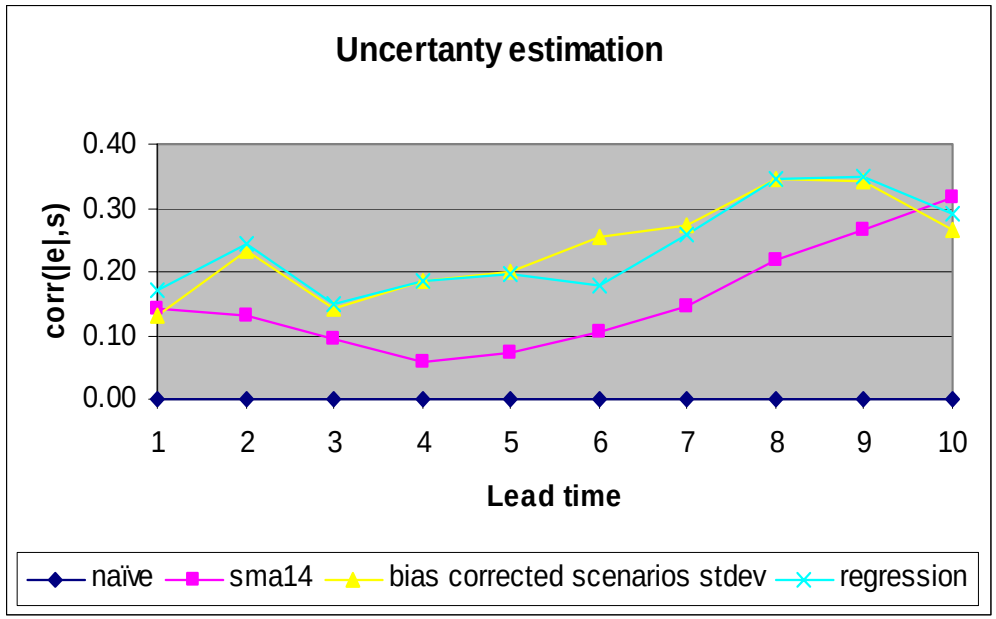
MAPE	Lead time									
	1	2	3	4	5	6	7	8	9	10
Univariate (uses no weather)										
pure ARMA	1.68	2.03	2.22	2.37	2.48	2.53	2.58	2.67	2.74	2.79
Mulitvariate (uses weather)										
observed	1.52	1.66	1.73	1.78	1.81	1.82	1.85	1.89	1.91	1.95
high resolution fcst	1.57	1.81	1.89	1.99	2.10	2.23	2.34	2.52	2.61	2.66
ens control fcst	1.57	1.79	1.93	2.08	2.06	2.23	2.34	2.47	2.53	2.59
mean of scenarios	1.56	1.76	1.87	1.92	2.01	2.10	2.18	2.32	2.41	2.41



Taylor & Buizza (2001, Int. J. For., in press)

σ_t estimators

	Lead time									
	1	2	3	4	5	6	7	8	9	10
Univariate										
naïve	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
sma14	.14	.13	.09	.06	.07	.11	.14	.22	.27	.32
ewma	.17	.15	.14	.02	.00	.00	.02	.21	.01	.01
garch	.15	.21	.16	.03	.07	.10	.13	.14	.21	.10
Ensemble based										
stdev of scenarios	.13	.23	.14	.19	.20	.25	.27	.35	.34	.27
bias corrected stdev	.13	.23	.14	.19	.20	.25	.27	.35	.34	.27
mixed garch	.13	.28	.14	.19	.21	.25	.27	.35	.35	.30
Combining sma14 and stdev of scenarios										
average	.17	.19	.13	.13	.13	.25	.21	.31	.34	.33
regression	.17	.24	.15	.19	.20	.18	.26	.35	.35	.29
smooth transition	.19	.18	.27	.17	.24	.24	.31	.35	.32	.29



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Summary

- Strong potential for use of weather ensemble predictions in electricity demand forecasting
- For all lead times, mean of 51 demand scenarios is better than usual procedure of using single deterministic high resolution weather forecasts
- Spread of 51 demand scenarios is very useful indicator of demand forecast uncertainty. $\sigma_{ENS,t}$ is useful for estimating σ_t of demand forecast error.
- Now focusing on estimation of demand predictive distribution and prediction intervals

Taylor & Buizza (2001, Int. J. For., in press)