Benefits and pitfalls of using percent error as a metric for day-ahead forecasting

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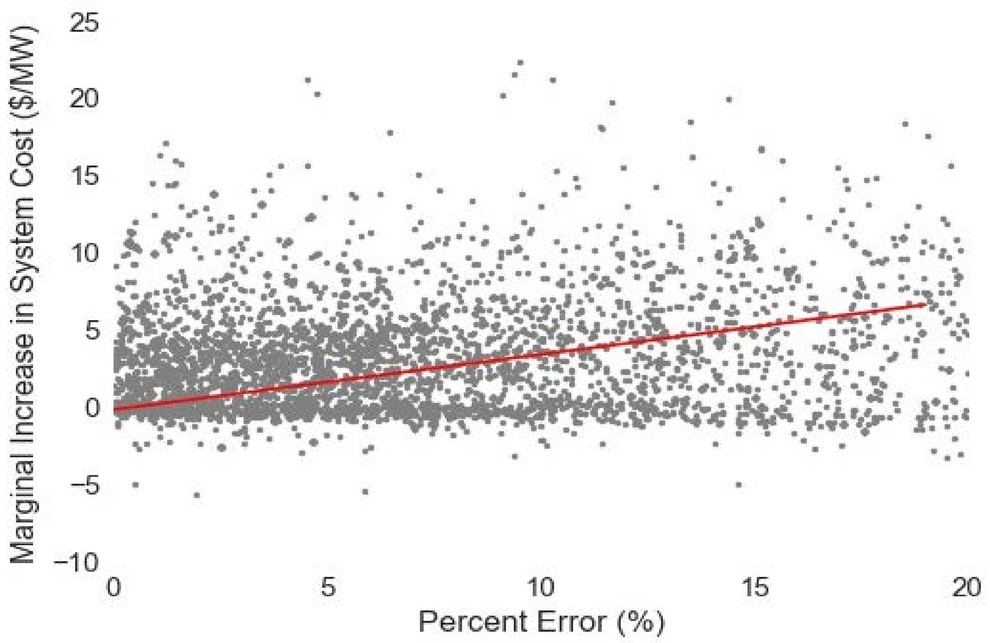
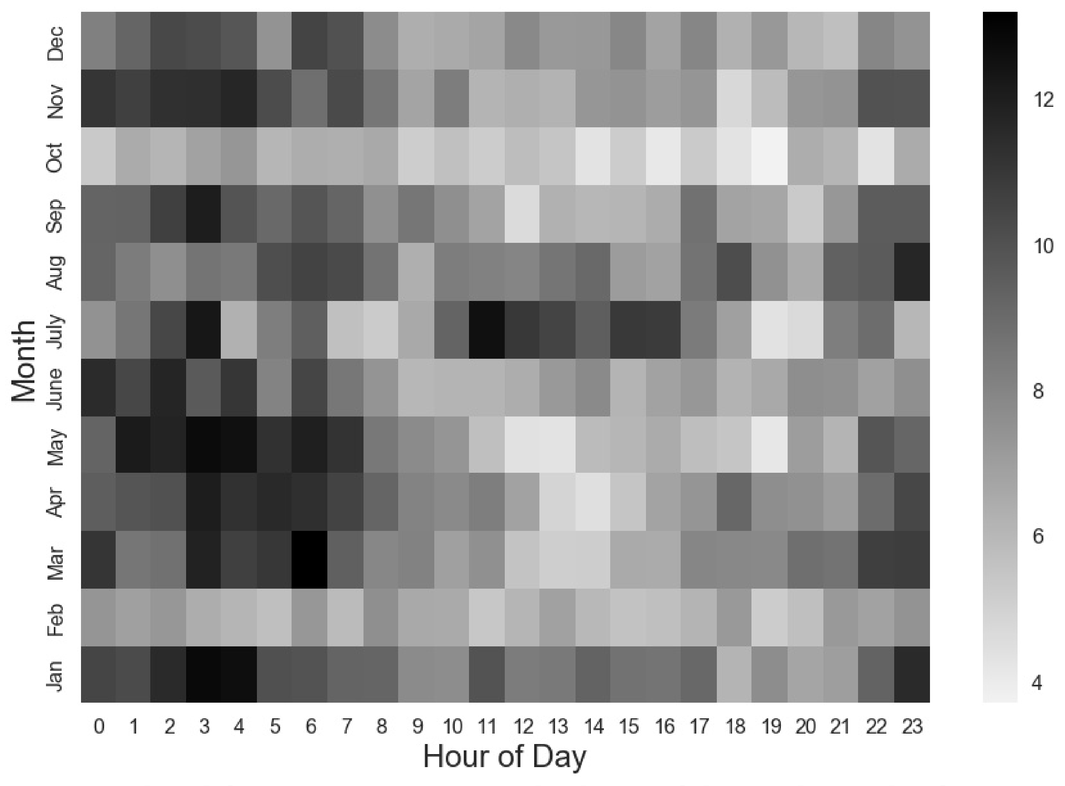
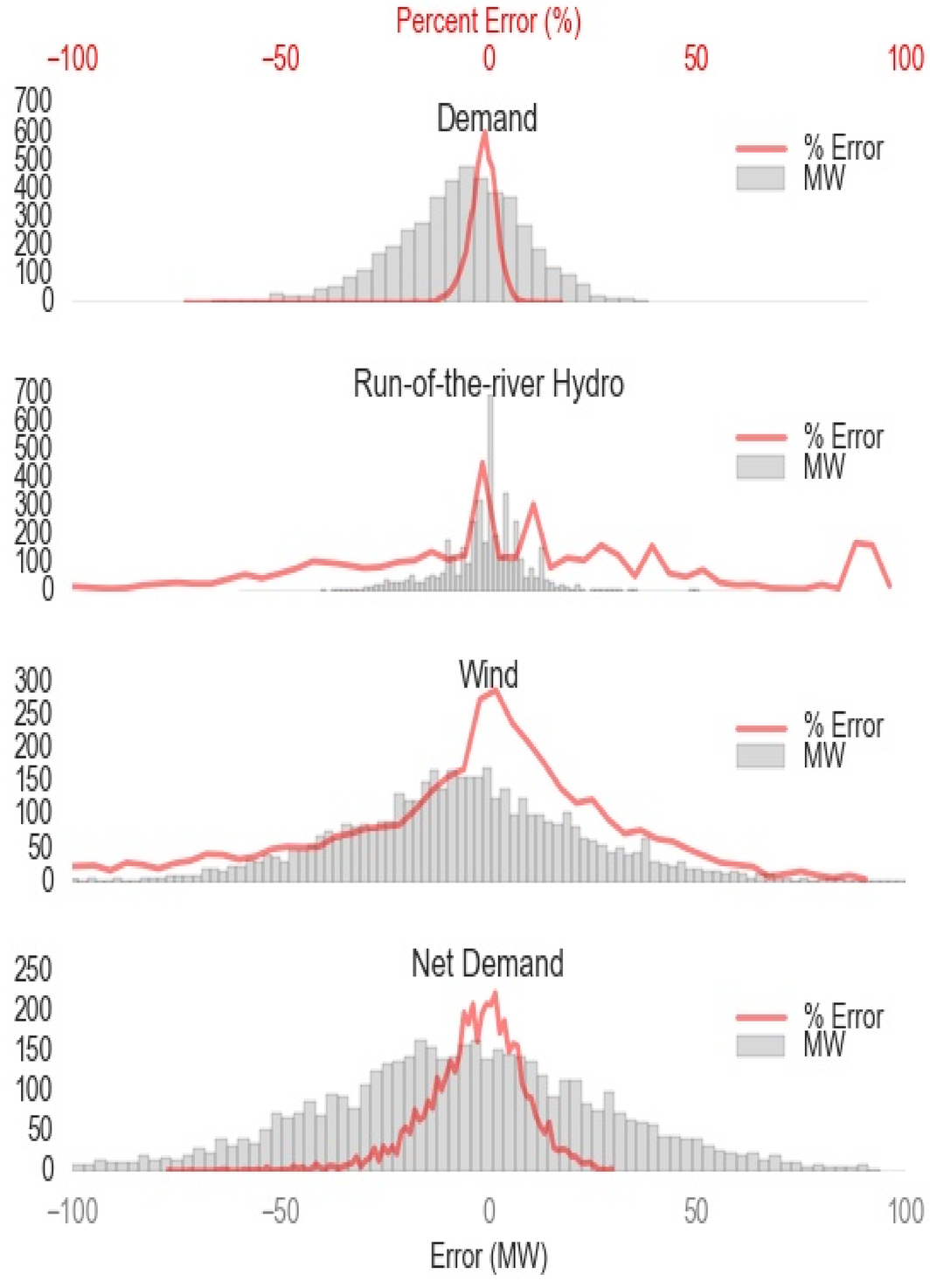
Day-ahead demand forecasting is used by grid operators to schedule generation units or set market prices for large power grids. Percent error is a common metric used to compare different forecasting approaches and assess the added value of each algorithm on grid operations. While percent error can be easily calculated and used to compare results across datasets, there are two issues with its use as a demand forecasting metric. First, error is not uniformly distributed across time or across generation mixes. Secondly, the effect of forecast error on increasing the overall cost of generation is indirect and variable. The relationship between error and increased system cost depends upon which units were initially committed using the day-ahead forecast and which units were used as operating reserves to correct for the error.



Comparison of day-ahead forecast error and increased per-unit system cost *(A weak relationship (r^2=.37) between error and increased system costs indicate the importance of exploring alternative forecasting metrics that are better proxies for increased system cost, or using system cost directly if possible)*



Day-ahead forecast percent error by hour of day and month of year



Day-ahead error in MW and percent error by type (*While demand has a narrow and normally distributed error, the error from predicted run-of-the-river hydro and wind production lead to a less smooth net demand error distribution)*

Nicaragua is used as a case study due to its available hourly demand and generation dataset (July 2015-Present) and relatively high (~50%) penetration of renewable generation. Results show that percent error does not have a clear relationship to system cost increases, leading to a need for future research that focuses on reducing costs and not solely percent error when developing forecasting algorithms.