A tail of two distributions: Or, what should energy price forecasters try to forecast (and how)?

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A tail to tell: standard econometric models fail us

1. Forecast failure is the rule
   • Tail risk hurts the most

2. Standard models offer little help
   • Poor track record – no confidence
   • Point forecast, MSE focus – wrong problem
   • Industry has a different problem –
     • Define plausible range of outcomes
     • Recognize risk of structural shifts
     • Prepare for those stress events

3. We offer 3 part alternative
   • Step 1: Parsimonious model of uncertainty / range
   • Step 2: Combination: one model is not enough
   • Step 3: Recursive model updates/re-assurance
Bayesian Forecast of Henry Hub Gas Price

1. Model design and operation
   • R Language – four quarter forecast, updated monthly.
   • In this simple case, variables = Gas Demand + Gas Production + Gas Inventories.
   • Data from EIA (direct link into R via API)
   • Start with a standard linear model: Henry Hub = XB + \( \varepsilon \) (B = vector of parameters).
   • Uniform Dirichlet distribution prior.

2. Output/Results
   • Fan chart
   • 2015 HH forecast range of ~US$2.00 to US$3.80/MMBtu
   • Actual stays within band for the 12 month out of sample forecast period (quarterly average).

3. Analysis
   • Awareness of downside risk – the forecast is not “wrong” when actual is in lower probability region. (95% interval))
   • Weather event – out of range at end 2015.
   • Signpost – watch inventories and demand as HH competitiveness overseas declines.
Wait – we’re not done! Combination / recursive approach

1. Combination forecasts perform better
   - Macroeconomic model
   - Consensus forecast, prediction market
   - Cost of supply analysis
   - Productivity monitoring
   - Policy monitoring

2. Transform forecast use & decision making
   - Bound the (current) uncertainty range
   - Develop signposts to monitor
   - Plan to be robust under uncertainty
     - Cost focus
     - Capital discipline
     - Opportunity for upside

3. Recursive forecasting process:
   - Updating / re-assuring models (parameters change)
   - Combining forecasts beyond an average value and model uncertainty.
Next steps in our research

- **Benchmarking**
  - Increased focus on benchmarking. To improve first you must acknowledge current gaps in your performance.

- **New Techniques**
  - Review emerging forecasting techniques – neural networks, artificial intelligence (AI), prediction markets, online search data.

- **Apply to other areas**
  - Expand forecasting capability to other aspects of business, i.e. capital costs, LNG shipping, operations etc.

- **Data**
  - Access to data, timely analysis and ease of use for decision making are a competitive advantage in industry.
"ONLY A SITH DEALS IN ABSOLUTES"
(and Why You Shouldn’t Believe It)