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 + ε (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)