Will U.S. Gas Prices Finish November Above $3.00/gal?

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Market: Kalshi KXAAAGASM-25NOV30

Forecast: $P(Price \geq \$3.00) = 59.37\%$ **(YES)**

1. Forecast Thesis

Gas prices remain in their typical winter/autumn decline, and our SARIMAX results show RBOB futures as the sole significant predictor of near-term movements out of other regressors like the Geopolitical Risk indicator, WTI Crude Oil Futures, & RBOB/WTI Crack Spread. This suggests retail prices will largely follow product-market trends rather than crude or macro inputs in the short run, keeping the November national average around 3.027$/gal, modestly above the $3.00 threshold.

2. Data & Methodology

- **Data:**
  - **Historical proxy for modeling:** EIA* weekly National retail gasoline price
  - **Inflation:** CPI-U NSA [FRED: CPIAUCNS]; forecasts ultimately de-normalized back to nominal dollars because settlement is nominal
  - **Exogenous drivers**:
    - **Crude Oil futures:** WTI front-month futures*
    - **Gasoline futures:** RBOB gasoline front-month futures*
    - **Crack spread:** RBOB − WTI spread
    - **Geopolitical Risk Index:** Exogenous to GARCH-t for volatility scaling

* Notes: AAA lacks an official historical download; we use EIA history to proxy. Futures series use the front-month; roll effects are acknowledged in Risks.

- **Model:**
  - **SARIMAX** on $log(EIA\ prices)$ with exogenous RBOB. [WTI and crack spread tested, dropped as it wasn't significant; log-prices to preserve positivity]
  - **GARCH-t(1,1)** to model residual volatility. [GPR tested, dropped as it wasn't significant]
  - **Monte Carlo** up to Nov 30 using SARIMAX mean & GARCH-t variance to build random price walks.
  - Probabilities for each price bucket were calculated using the Monte Carlo walks.

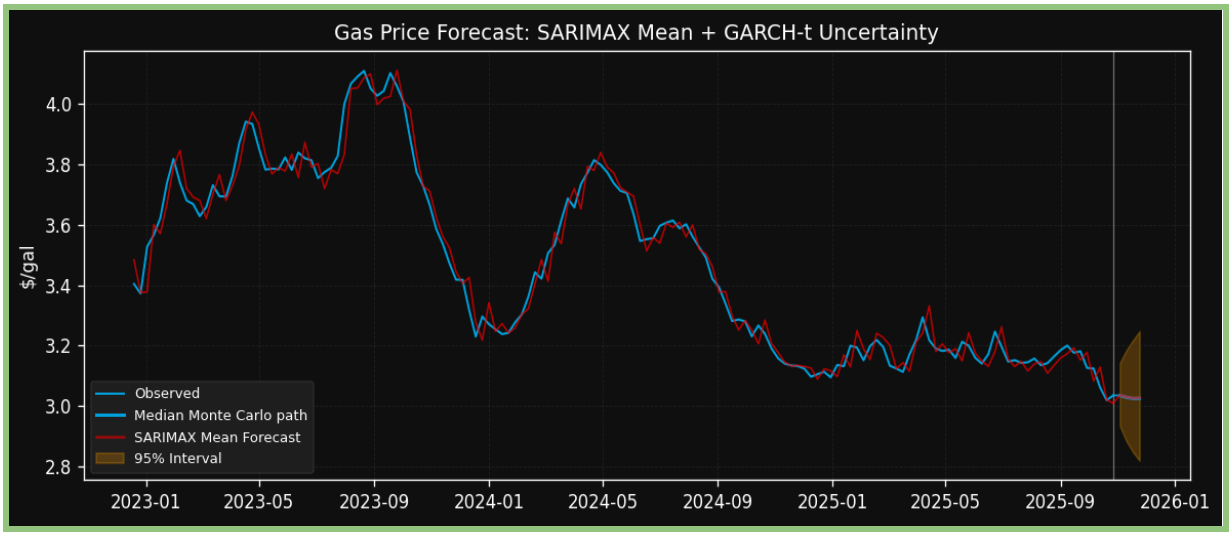
3. Results

Point forecast: **3.027** $/gal

95% Confidence Interval: **2.82** @ **3.25** $/gal

Price Bucket	Above $2.90	Above $2.95	Above $3.00	Above $3.05	Above $3.10
Prob. Forecast	89.09%	77.48%	**59.37%**	39.91%	23.54%

The November price forecast distribution is **slightly right-skewed** (log-normal). This makes sense since seasonal decline in November prices would make smaller values more likely.



4. Trading Framework (Half-Kelly strategy)

Market quotes are not yet available. Once listed, we apply a **half-Kelly rule** to manage risk:

$(i)\ f_i = 0.5 \times \frac{p_i - y_i}{1 - y_i}$ ***if*** $(f_i > 0)$ ***Long (with Kalshi YES contracts)***

$(ii)\ f_i = 0.5 \times \frac{1 - p_i - n_i}{1 - n_i}$ ***if*** $(f_i < 0)$ ***Short (with Kalshi NO contracts)***

$(iii)\ \sum_i f_i \leq 0.5$ ***Total Exposure Cap***

where $y_i, n_i = Kalshi\ YES/NO\ Price$, $p_i = Our\ forecasted\ probability$, ***and*** $f_i = Fraction\ of\ bank\ roll\ to\ bet$

$\forall i \in \{2.90,\ 2.95,\ 3.00,\ 3.05,\ 3.10\}$. ***Eg:*** $p_{3.00} = P(Price \geq \$3.00)$

If (iii) doesn't hold, we scale down all fractions to meet the condition. We use half-Kelly sizing **to manage correlation** across price buckets/bets. Until prices are published, we only outline this sizing approach; actual fractions will be computed post-listing.

5. Risks & Alternatives

- **Macro:** Our forecast hasn't been normalized using the latest CPI (Oct), since it hasn't been released yet. That CPI shock could alter normalization. Consumer demand wouldn't be affected in such a short term.
- **Supply/Demand:** Refinery outages, OPEC shifts, black swan events like COVID-19. These cannot be reasonably predicted.
- **Roll-over effects:** RBOB Futures volatility exaggerates risk near contract roll, leading to spiky price action at month-ends. Hence, we don't use it in our GARCH model.
- **Weather shocks:** Storms on the South-East coast can disrupt refineries and lead to supply shocks. If Hurricane Melissa makes landfall in SE USA, prices will spike.
- **High correlation in price buckets:** High correlation could lead to massive drawdowns even after using Kelly, since neighbouring price buckets will settle similarly except for the two buckets surrounding the settlement spot price. We account for this using half-Kelly, but more sophisticated risk-control measures could've been employed.

- **Scenarios:**
  - **Bull (>3.10$):** Hurricane Melissa makes landfall in SE USA/tensions between US and oil nations rise.
  - **Base (~3.02$):** Stable crude supply and demand. Normal functioning market.
  - **Bear (<2.90$):** CPI Shock showing massive decrease in consumer spending and hence demand.

6. Conclusion:

Our model favors **YES** at **3.00 $/gal** with **59.37%** probability. When Kalshi prices appear, we'll execute portfolio balancing using the half-Kelly framework to size exposure proportionally to the perceived edge while controlling variance.