Discussion:

Driven by Fear? The Tail Risk Premium in the Crude Oil Futures Market

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2016 Volatility Institute Conference

This Paper

High-level summary

- How much are investors willing to pay for insurance against increases in oil price volatility?
  - This determines the swap rate in a variance swap

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  - This determines the swap rate in a variance swap
- Volatility can come from two sources:
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- This paper: how much are investors willing to pay for insurance against increases in oil price volatility *that come from big jumps*?
- Main findings:
  - A lot and time varying
  - Not all vol is the same
  - Predicts oil returns

Big Picture Comments

1. Is Oil Special?
   - We know there is a large variance risk premium (VRP) for the S&P 500
   - Also know that a fair amount of this comes from tail movements
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Big Picture Comments

1. Is Oil Special?
   - We know there is a large variance risk premium (VRP) for the S&P 500
   - Also know that a fair amount of this comes from tail movements
   - Does oil just load up on the market volatility factor?

2. The link between expected oil future returns and tail-induced VRP
   - What type of model would deliver these forecasting results?
   - Do we learn anything about the term structure of uncertainty insurance?

Some Structure

- Futures dynamics:

$$\frac{dF_t}{F_{t-}} = \text{drift} + \sigma_t dW_t + \int_{\mathbb{R}} (e^x - 1)\tilde{\mu}(dt, dx)$$

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- Two types of risk:
  - Underlying risk in the futures contract
  - The risk that risk will change

Defining Jump-Induced Volatility Risk

- Variance risk premium:

$$\begin{aligned} VRP(t,T) &= \mathbb{E}^{\mathbb{P}}\left[QV(t,T)\right] - \mathbb{E}^{\mathbb{Q}}\left[QV(t,T)\right] \\ &= \text{Premium for Bearing Continuous Vol Risk} + \\ &\quad \text{Premium for Bearing Jump-Induced Vol Risk} \end{aligned}$$

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- Goal = isolate the premium for bearing (large) jump-induced vol risk
- Use the methodology from Bollerslev, Todorov, and Xu (2014) applied to oil futures and options:
  - Short dated options for the $\mathbb{Q}$-measure
  - High-frequency future prices for the $\mathbb{P}$-measure

The Price of Insurance and Forecasting

Data from Table 1 and Table 3

- On average, for $100 of insurance, investors are willing to pay:
  - $2.32 to hedge against volatility risk coming from left-tail events
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- Forecasting results:
  - When premium for right-tail induced volatility risk is high, subsequent spot/future returns are low
  - Opposite is true for left-tail induced vol risk

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- Is estimated premium for oil just a byproduct of this exposure?
- One way to get at this:
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- If not, one reasonable alternative is that oil market is segmented:
  - Variation driven by capital of insurance providers
  - Who is on the other side of the swap?

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Forecasting results are intriguing, but need more interpreting

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- What model would predict the obtained signs in the forecasting regressions of oil returns?
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  - Volatility insurance premium also reflects their capital
- Timing mismatch:
  - Jump-risk measures use short-dated options
  - Forecasting regressions go all the way up to 6 months
  - Results suggest a term-structure (Aït-Sahalia, Karaman, Mancini (2015))

Final Thoughts

- Interesting and topical market, fun to think about
- Forecasting results seem promising
- A lot of moving parts
- Would benefit with some more economic structure and interpretation

Thank You!

Other Issues

- In absolute value, the VRP should be bigger than the LJP + the RJP, right?
- Table 1 should have t-statistics, so we can make sure the means are reliably different than zero
- Should use Hodrick standard errors for forecasting regressions