A General Approach to Recovering Market Expectations from Futures Prices With an Application to Crude Oil by Christiane Baumeister and Lutz Kilian

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Motivation

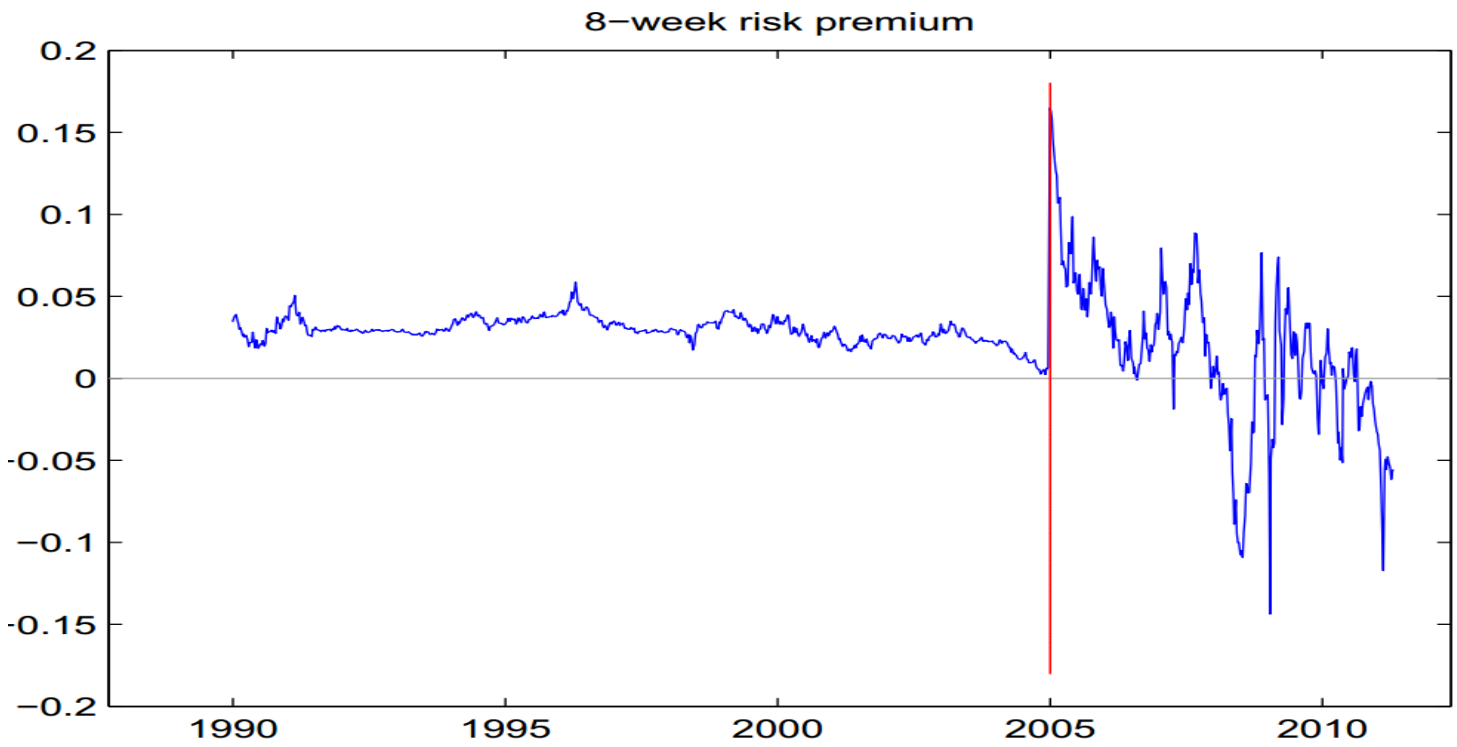
The is a great paper and worth reading!

- Object of interest
  - Infer market expectation of future spot price $E_t[S_{t+n}]$ from futures prices
  - Expectation can be expressed as

$$E_t(S_{t+n}) = F_t^n - RP_t^n$$

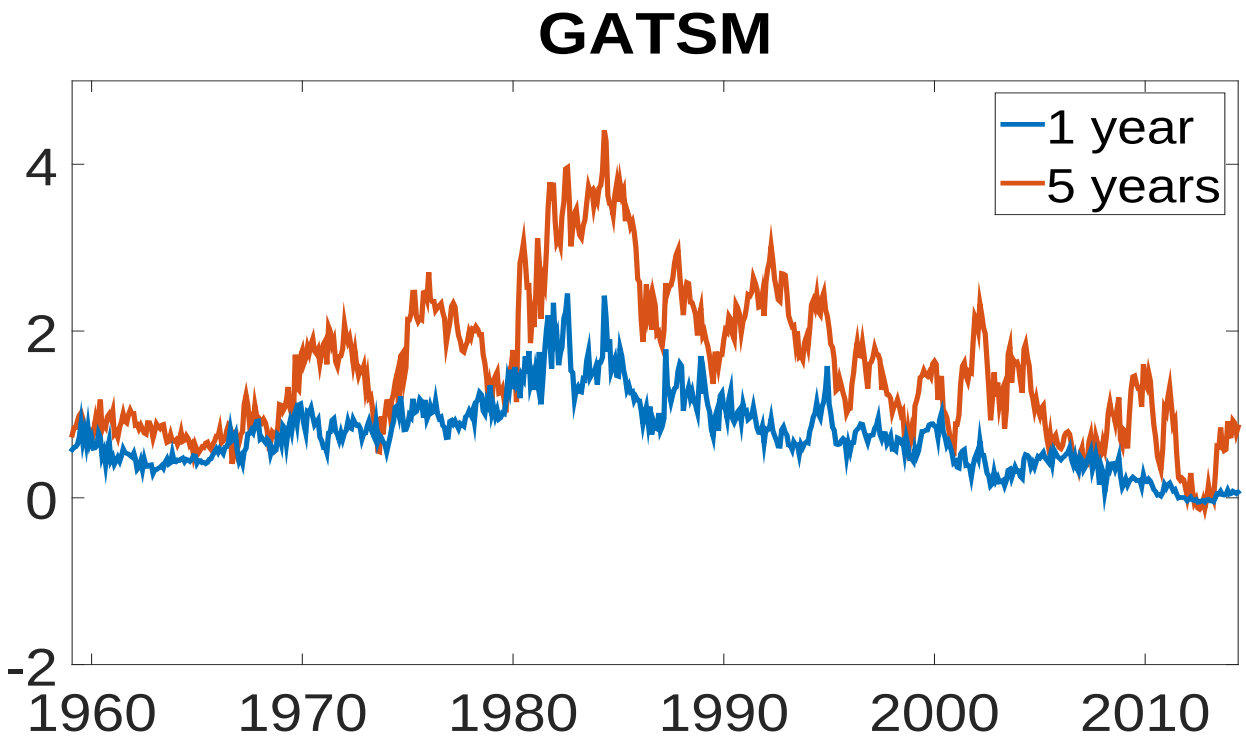
  - This is equivalent to computing the risk premium RP_t^n

Time variation in oil future risk premium



$\tilde{f}_t^8 - f_t^8$, where f_t^8 is log future price
Source: Hamilton and Wu (2014)

Time variation in bond risk premium



$tp_t^n = y_t^n - \frac{1}{n} E_t[y_t^1 + ... + y_{t+n-1}^1]$

Source: Creal and Wu (2016)

y-axis: in percentage points

Methods in the literature

$$E_t(S_{t+n}) = F_t^n - RP_t^n$$

- Use futures prices as $E_t(S_{t+n})$
- Return forecasting regression for $\frac{S_{t+n}-F_t^n}{F_t^n}$
  - Fama and French (1987) with one regressor
  - Augment with more regressors
- Hamilton and Wu (2014)
  - extract RP_t^h from the term structure
  - a factor structure driving log futures prices
  - compute expectations of factors, and hence log prices
  - RP_t^h = actual price - rational expectations

Hamilton and Wu (2014)

Log price linear in $(m \times 1)$ factors x_t

$$f_t^n = \log F_t^n = \alpha_n + \beta_n' x_t.$$

Factor dynamics

$$x_{t+1} = c + \rho x_t + \Sigma u_{t+1} \quad u_{t+1} \sim \text{ i.i.d. } N(0, I_m)$$

Risk prices in affine form

$$\lambda_t = \lambda + \Lambda x_t.$$

Factor loadings are analogous to ATSM recursion

$$\begin{aligned} \beta_n' &= \beta_{n-1}'\rho - \beta_{n-1}'\Lambda \\ \alpha_n &= \alpha_{n-1} + \beta_{n-1}'c + (1/2)\beta_{n-1}'\Sigma\Sigma'\beta_{n-1} - \beta_{n-1}'\lambda. \end{aligned}$$

Contribution

Contribution: a framework to evaluate methods to compute expectations in the literature

- Criterion 1: MSPE metric

$$E[S_{t+n} - E_t(S_{t+n})]^2$$

- Criterion 2: longer-term expectations should evolve smoothly
- Criterion 3: event studies
- Criterion 4: out-of-sample comparisons

Comment 0

What I like about this paper

- The authors motivate the importance of understanding expectations nicely.
- The authors have done an elaborate study comparing the methods in the literature.

Comment 1

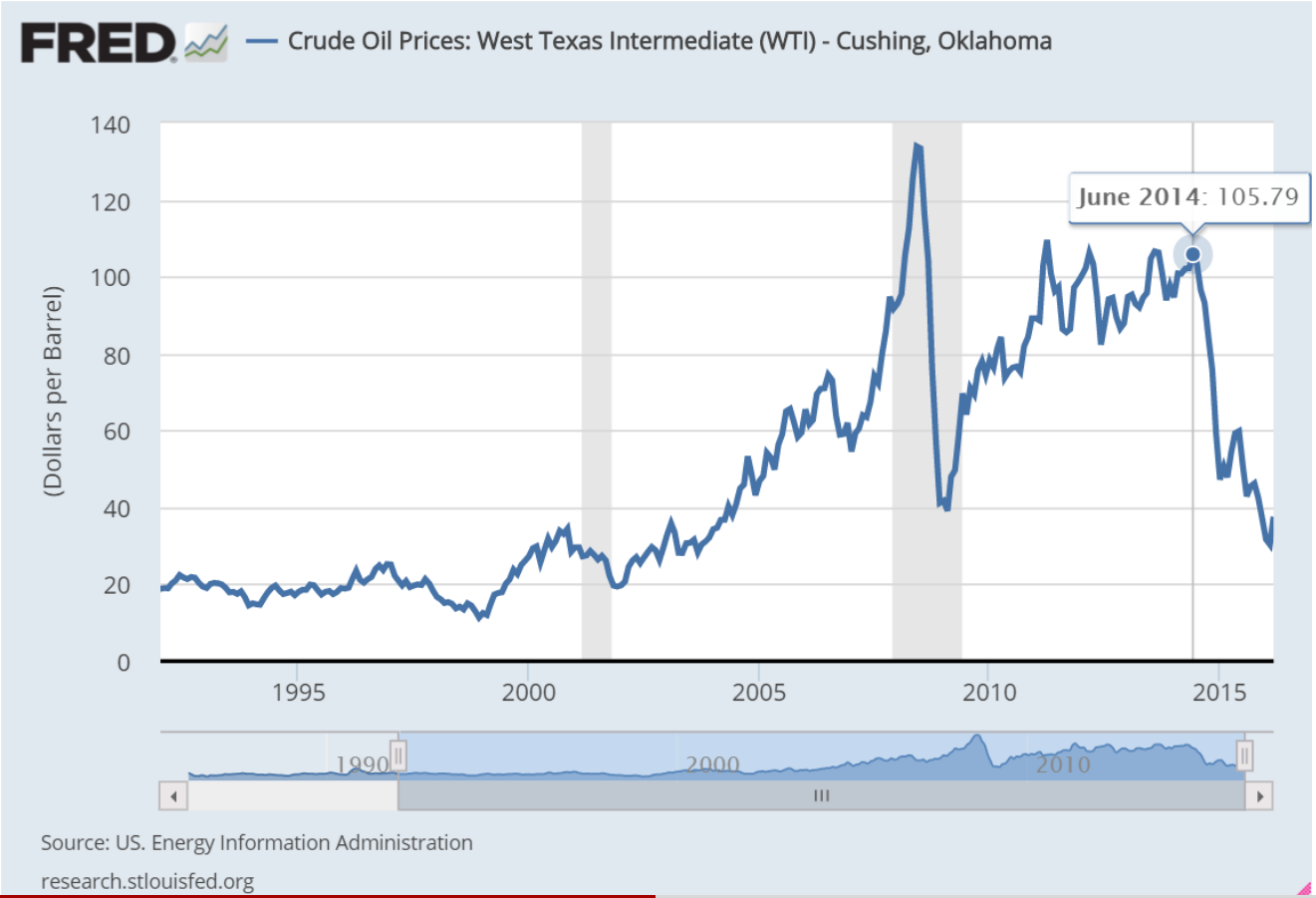
The econometric analysis of model comparison is elaborate

- Can you tie back to the economic motivations?
  - What kind of different economic implications do these models make?
  - What are the policy implications?
  - A neat example would be the policy makers did P^A during this episode because they used method M^A to infer the expectations. If they take the alternative better method M^B, they should implement an alternative policy P^B instead.

Comment 2

Oil price has experienced a dramatic drop since June 2014

- What is the implication for the recent episode of low oil prices?
- How does the risk premium look?



Comment 3

What scale should we work on?

- level of the price
  - more intuitive, and risk premium is denoted in dollars
  - the price series is exponential
  - The calculation might be heavily influenced by the episode with high prices

- log price
  - relatively equal weights over the periods with low and high prices
  - difference has a return interpretation
  - closer to definition of risk premium in the bond market, for example

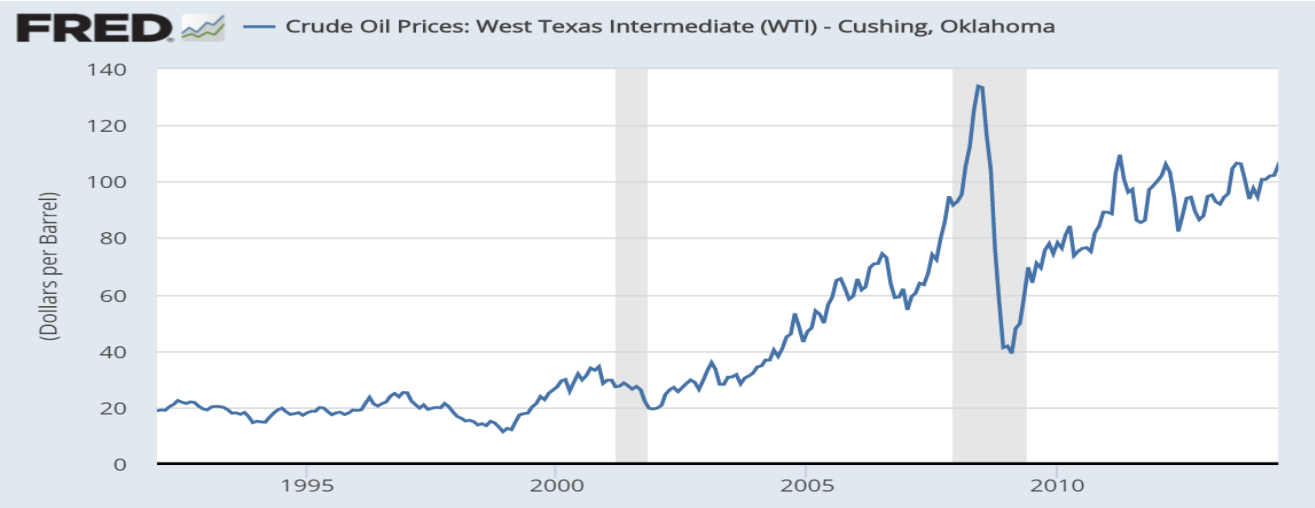
$$tp_t^n = y_t^n - \frac{1}{n} E_t[y_t^1 + ... + y_{t+n-1}^1]$$

where

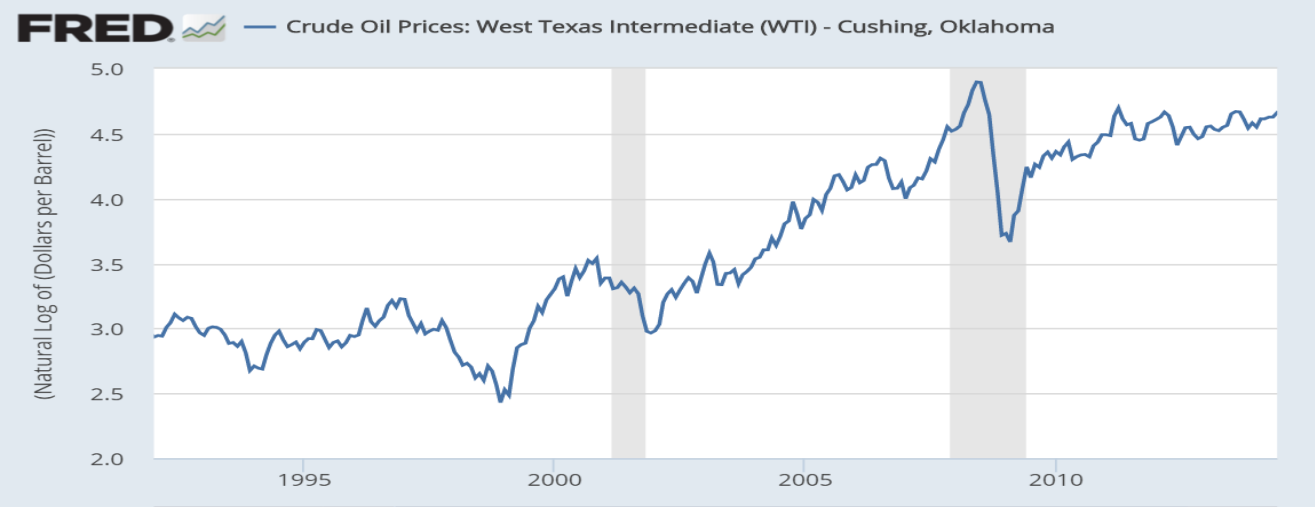
$$y_t^n = -\frac{1}{n} log P_t^n$$

Comment 3

price



log price



Conclusion

Overall, this is a very interesting paper!

- The authors provide a comprehensive framework to assess various methods to extract market expectations
- Comment 1: policy implication
- Comment 2: recent episode of price drop
- Comment 3: level vs. log