Physical Market Conditions, Paper Market Activity and the WTI-Brent Spread
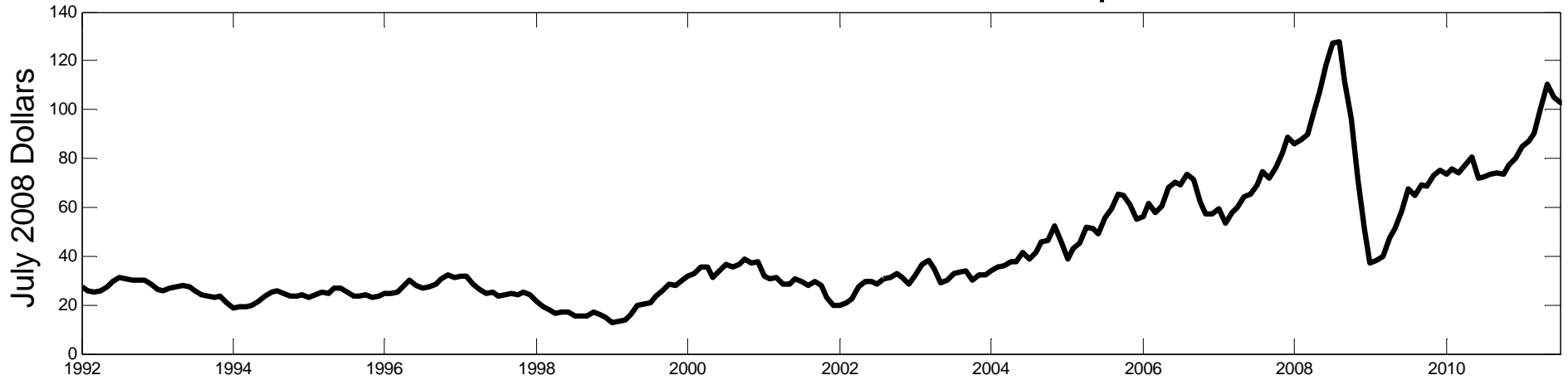
Discussion by:

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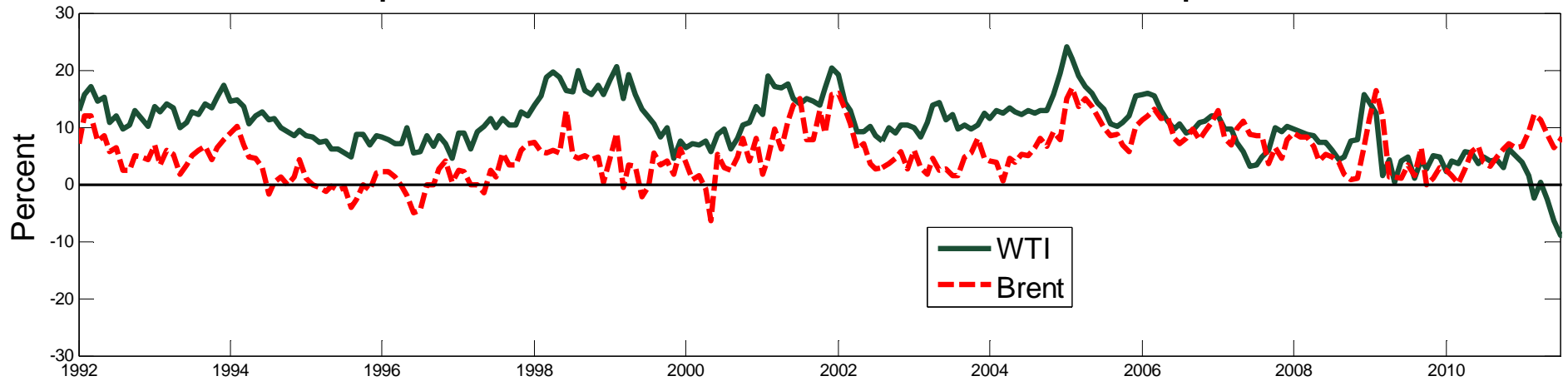
Crude Oil is Not Perfectly Homogeneous

● Differences in:
- Composition
- Location

● Traditional approach:
  Use of Benchmarks (WTI, Brent)

● What explains the growing spread of Brent over WTI crude oil?

● Is the WTI price unusually low or the Brent price unusually high?

U.S. Real RAC for Crude Oil Imports

Spread Over U.S. RAC for Crude Oil Imports

Source: Baumeister and Kilian (2012)

Candidate Explanations

- Regional supply shocks:

    Libyan supply disruption (temporary)

    Strikes affecting North Sea fields (temporary)

    U.S. shale oil (persistent)

- Regional demand shocks

    Arab Spring (political risk, persistent?)

    Growing European demand for diesel fuel (persistent)

    Fukujima (temporary?)

    U.S./Euro Financial Crisis (persistent?)

- International transmission complicated by

  - Bottleneck in European refinery processing capacity

  - Bottlenecks in transportation infrastructure limiting trade in crude oil or in refined products

Data

Daily oil price data: June 2000-July 2012

    WTI

    Brent

    Louisiana Light Sweet (LLS)

Regression analysis:

    Daily data

    Weekly and monthly aggregates of the daily data

Decomposing the Spread

Proposal in paper:

$$f_t^{WTI} - f_t^{Brent} = (\underbrace{f_t^{WTI} - s_t^{LLS}}_{U.S.\,landlock\,spread}) + (\underbrace{s_t^{LLS} - s_t^{Brent}}_{transatlantic\,spread}) - (\underbrace{f_t^{Brent} - s_t^{Brent}}_{Brent\,nearby\,spread})$$

Alternative proposal:

$$f_t^{WTI} - f_t^{Brent} = (\underbrace{f_t^{WTI} - s_t^{WTI}}_{WTI\,nearby\,spread}) + (\underbrace{s_t^{WTI} - s_t^{LLS}}_{U.S.\,landlock\,spread}) + (\underbrace{s_t^{LLS} - s_t^{Brent}}_{transatlantic\,spread}) - (\underbrace{f_t^{Brent} - s_t^{Brent}}_{Brent\,nearby\,spread})$$

Q: Note that there is no *landlock spread* for Brent. Why?

Q: Is the landlock spread influenced by differences in crude quality?

=> It would have been great to see plots of each spread over time.

Structural Break Tests for Spreads

- One-Time Mean Shifts in Spread at Known Dates

    November 2008, December 2010, (late) Fall 2008

- Is the Date Really Known Precisely?

    Endogenous break point selection

    Bootstrap critical values? (Diebold and Chen JoE 1996)

- One Break or More?

    Temporary shifts in demand or supply call for multiple

    breaks; so do multiple events.

- Rationale for Deterministic Time Trend in Spread?

Alternative Regression Models?

Statistical Models:

Deterministic Break Models with Multiple Breaks

TVP Model

State-Dependent Models for Mean

Threshold Models (in terms of observables)

Models with common factors and idiosyncratic factors

Findings

Breaks only in *Brent nearby spread* and in *U.S. landlock spread*.

No break in *transatlantic spread*.

Explaining the Evolution of the Spread

1. Regional macroeconomic business cycle

    1. SHIP (global) versus Aruoba-Diebold-Scotti (U.S.)

    2. SHIP (global) versus U.S. stock of crude oil

=> As a measure of U.S. macroeconomic health? Really?

Q: Shifts in relative "demand" needed for explaining the relative price (spread)? => Perez-Quiros: Index for Euro Area.

2. Lack of Physical Market Integration

● Brent Crude Oil Production

    Q: Don't we need production relative to WTI crude oil?

    Q: What about European oil imports? Substitute?

    Q: What about Canada? Does the quality not matter?

● OPEC production spare capacity outside of Saudi Arabia

    Q: Rationale for excluding Saudi Arabia?

    Q: Differences in quality? (e.g., Libya versus Venezuela)

    Q: What about ROW oil producers? (e.g., Russia, Nigeria)

    Q: How does this capture market conditions for seaborne crude (and why would we care)?

● Storage Conditions in Cushing, OK (slope of WTI term structure adjusted for LIBOR)

    Q: Why does this matter as opposed to the bottlenecks in getting the oil out of Cushing?

    Q: How do we separate voluntary from involuntary storage?

    Q: What about storage conditions in Europe? Slope of Brent term structure?

    Q: Relative slopes needed for explaining the relative price?

3. Financial variables

● Does the financialization of oil futures markets explain the Brent-WTI spread?

      Liquidity in oil futures market

      Trader positions (long versus short)

Q: Correlation ≠ Causation. We need to ask why traders took those positions.

● Not related to financialization:

      Changes in financial market stress (Ted spread)

      Arab Spring Dummy (really an expected fundamental!)

ARDL Methodology for Causal Inference?

● Current spread regressed on own-lags and current and lagged values of selected explanatory variables.

● Causal structure imposed: Explanatory variables cause spread.

● Unless the explanatory variables are exogenous, one cannot compute dynamic effects from this regression. We need the full system of equations.

● The coefficients of the cointegrating vector are not the long-run response to exogenous variation in the explanatory variable.

Better question:

Can the evolution of these spreads be predicted?

This requires:

    - Dropping the contemporaneous regressors

    - Enforcing real-time data constraints

Alternative:

    - Forecast combination model

Benchmark:

    Random walk model of spread (Baumeister & Kilian 2012)