

The Role of Speculation and other Drivers of the Real Price of Crude Oil

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Limitations of Traditional Oil Market Models

⇒ Market expectations of future oil demand and oil supply conditions are equated with econometric expectations.

⇒ Problem:

Speculation is all about forward-looking behavior.

There is a potentially important forward-looking element in the real price of oil.

Examples of Forward-Looking Elements in Expectations of Oil Demand and Supply Conditions

Supply side: New oil discoveries (Brazilian off-shore oil fields)

Anticipation of a War in the Middle East

Anticipation of “peak oil” effects

Demand side: Anticipation of a booming world economy

Anticipation of a major global recession

Anticipation of new energy-saving technologies

Key Insights

Shifts in expectations about future oil demand and/or oil supply conditions manifest themselves as shifts in the demand for oil inventories:

- ⇒ Expectation shifts cause a shift of the oil demand curve along the oil supply curve, conditional on past data
- ⇒ Raw data on inventories are not informative. We need to model all determinants of oil inventories simultaneously, if we want to capture the expectations-driven component in the inventories.

Structural Model of the Global Crude Oil Market

Monthly data for 1973.2-2010.6:

1. Percent change in global crude oil production
2. Index of global real activity (in deviations from trend)
3. Real price of oil
4. Change in above-ground global crude oil inventories

Four Shocks

1. Shock to the flow of crude oil production (“flow supply shock”)
2. Shock to the demand for crude oil driven by the global business cycle (“flow demand shock”)
3. Shock to the demand for above-ground oil inventories arising from forward-looking behavior (“speculative demand shock”)
4. Residual shock that captures all structural shocks not otherwise accounted for and has no direct economic interpretation (e.g., weather shocks, shocks to inventory technology or preferences, idiosyncratic changes in SPR).

1. Identifying Assumptions on Sign of Impact Responses

	Flow Supply Shock	Flow Demand Shock	Speculative Demand Shock
Oil Production	-	+	+
Real Activity	-	+	-
Real Oil Price	+	+	+
Inventories			+

2. Bound on One-Month Price Elasticity of Supply

$$\eta^{Oil\ Supply} \leq 0.025 \text{ (baseline)}$$

3. Bound on One-Month Price Elasticity of Demand

$$-0.8 \leq \eta^{Oil\ Demand} \leq 0$$

4. Dynamic Sign Restriction

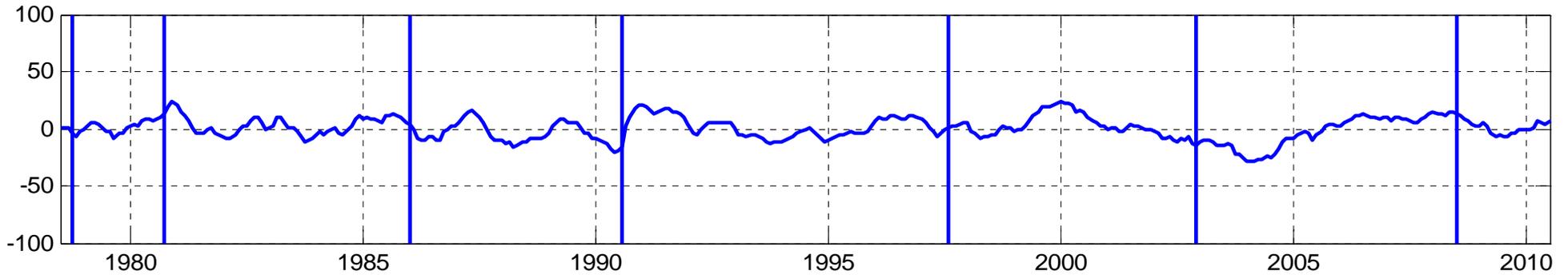
For the first year after an unexpected oil supply disruption, the real price of oil must remain weakly positive.

Why do we not include the oil futures spread?

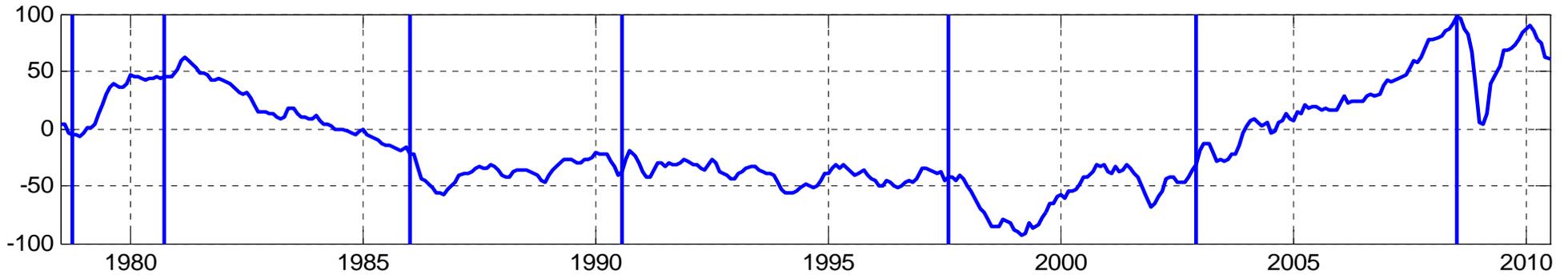
- Spot market and futures market are two distinct markets linked by an arbitrage condition (Alquist and Kilian JAE 2010).
- Inventory data will capture spillover from oil futures market.
- Testable implication: Oil futures spread does not Granger-cause the variables included in the VAR model (Giannone & Reichlin JEEA 2006).
- In the absence of an oil futures market (or when arbitrage fails), our model would remain well-specified.

Historical Decompositions for 1978.6-2010.6

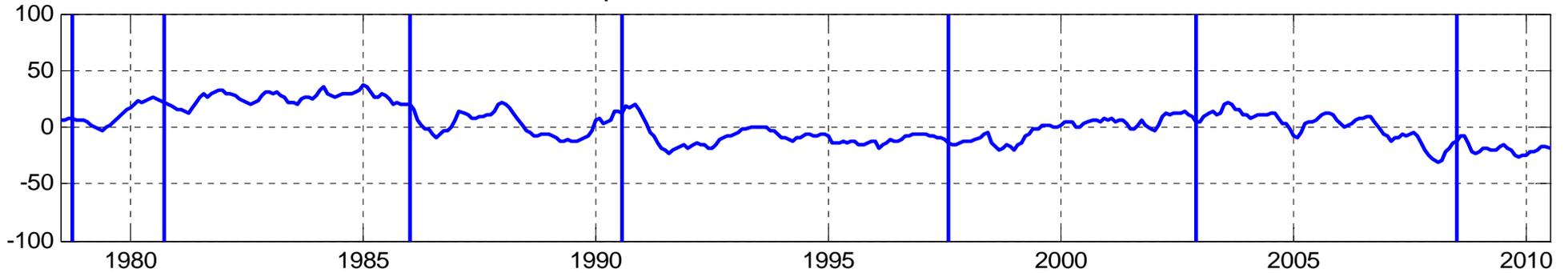
Cumulative Effect of Flow Supply Shock on Real Price of Crude Oil



Cumulative Effect of Flow Demand Shock on Real Price of Crude Oil



Cumulative Effect of Speculative Demand Shock on Real Price of Crude Oil



What Explains the 2003-08 Oil Price Surge?

- No evidence that speculation by oil traders was responsible.
- No evidence that OPEC was behind the oil price increase.
- No evidence that “peak oil” has been the cause.
- Strong evidence that an unexpectedly booming world economy was the cause.

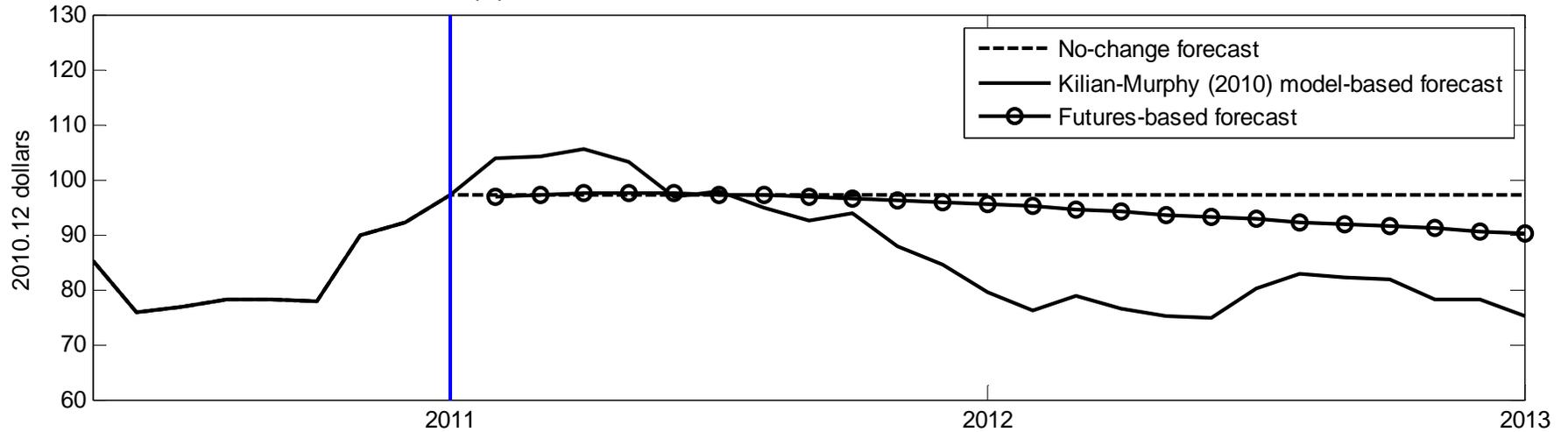
Related evidence in Kilian and Hicks (2009):

⇒ Systematic errors by professional forecasters

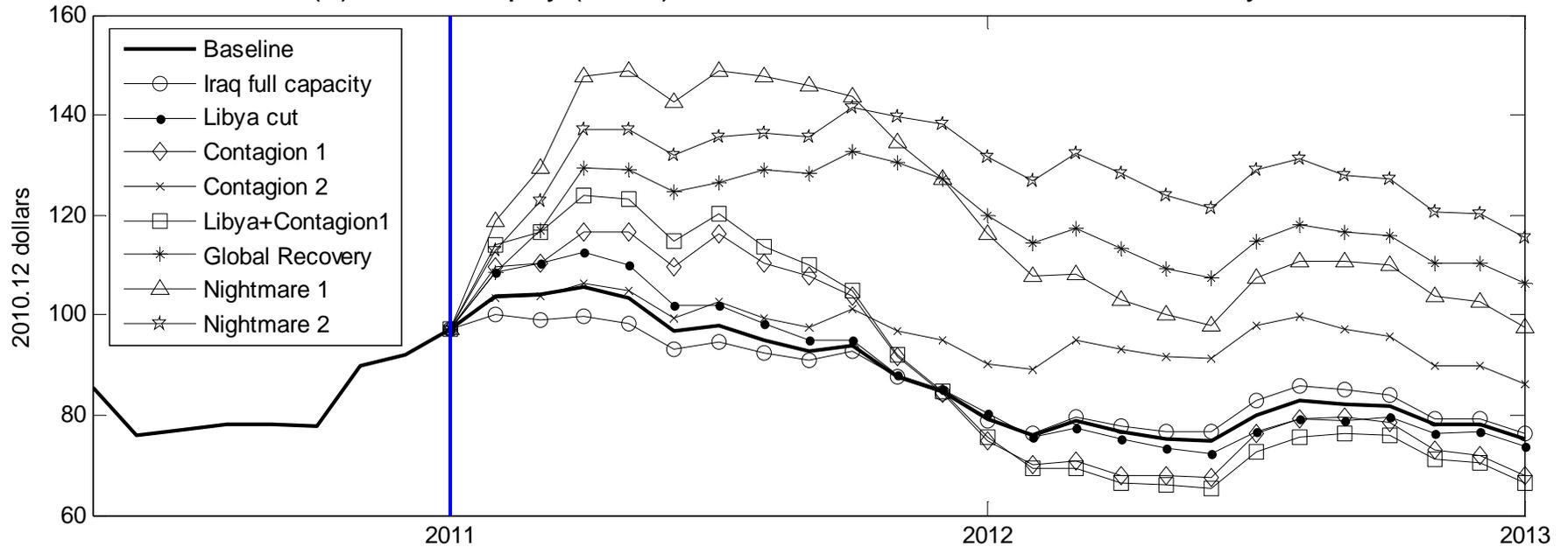
⇒ Key role for emerging Asia

Real-Time Forecast of Real U.S. RAC for Crude Oil Imports

(a) Alternative Baseline Real-Time Forecasts



(b) Kilian-Murphy (2010) Model-Based Forecast and Risk Analysis



Three Policy Conclusions

1. Increased regulation of oil traders will not keep the real price of oil down.
2. Increased domestic oil production in the U.S. will not lower the real price of oil materially.
3. Efforts to revive the world economy will cause the real price of oil to recover, creating a policy dilemma.