What Drives Natural Gas Prices?

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Oil and Natural Gas Prices

• Close substitutes in the past
  – industrial production and electricity generation
• Substitutability has declined
• Prices seem to have decoupled
Pricing Rules of Thumb

Do Oil Prices Matter?
Some Pricing Rules

- 10-to-1: Henry Hub price is $0.1 \times WTI$.
- 6-to-1: Henry Hub price is $0.1667 \times WTI$.
- Burner-tip parity: Henry Hub price is $-0.50 + 0.1511 \times WTI$.
  - Based on competition with residual fuel oil.
- Simple regression: Henry Hub price is $1.5977 + 0.0698 \times WTI$. 
Old Rules of Thumb

$/MMBtu

Henry Hub Spot

6:1 Rule

10:1 Rule
Looking Beyond Pricing Rules of Thumb
Other Factors Driving Natural Gas Prices

- Weather
- Seasonality
- Storage
- Production Disruptions
Econometric Modeling

• Crude oil and natural gas prices move together in the long run
• Changes in crude prices lead changes in natural gas prices
• Short term dynamics explained by exogenous variables such as
  – Weather, storage and disruptions
Natural Gas Price
Long-run relationship with oil prices

$/MMBtu

Actual Spot

Linear Bivariate Relationship with Oil
Other Econometric Studies

• Ramberg and Parsons (2010)
  – Find that the oil and gas cointegrating relationship has changed in recent years
  – Dec 2005 – Feb 2009 period: Natural gas prices discounted with respect to oil
Natural Gas Production

MMcf, Thousands

[Graph showing natural gas production over time, with values ranging from 55 to 69 MMcf.]
Oil and Gas Rig Count

Rig Count, SA

Gas Rig Count

Oil Rig Count

Shale gas drives horizontal drilling
Natural Gas Price
Brown-Yücel Model

$/MMBtu

Actual (Henry Hub)
Fitted (Brown-Yücel Model)
Natural Gas Price Outlook

Conditional Outlook
(based on WTI, avg natural gas output growth, normal weather and a normal storage)

Futures Price
Conclusions

- Simple rules of thumb don’t perform well
- Natural gas prices linked to oil in the long run
- Short term dynamics driven by exogenous factors such as
  - weather, seasonality, storage, output disruptions
- Relationship may have shifted
- Gas prices at a discount to oil prices
  - Oil prices driven by global demand
  - Natural gas prices pressured by increased supply
What are the Models Missing?

• Declining LNG imports

• Influence of financial markets?

• ...more research needs to be done.