Energy Micropricing

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Commodity Transformations

- All commodities undergo transformations through the value chain
- Transformation in space (transportation)
- Transformation in time (storage)
- Transformation in form (processing)
Some Examples

- Power plants transform fuel into power
- Pipelines transform gas in one location to gas in another
- Storage terminals convert oil today to oil tomorrow
Complexity

Most commodities go through numerous transformations of all 3 types

- Think of the process of transforming oil at the wellhead to gasoline at the pump
- Multiple spatial transformations (VLCC, pipeline, truck)
- Multiple physical transformations (at refinery)
- Storage at “break points”
Bottlenecks

Every transformation process has bottlenecks

Bottlenecks constrain the transformation process

The tightness of these constraints can vary over time
Some Examples

- Pipeline capacity
- Transmission capacity (e.g., thermal, voltage limits)
- Refinery capacity
- Limits on rate of flow into and out of gas storage facilities (which can vary depending on type of facility)
Regulatory Bottlenecks

- Regulatory factors are an increasingly important source of bottlenecks.
- Gasoline formula regulations that vary by geographic region (e.g., Midwest)
- NOX or SOX limits (again may be geographic variation in these constraints)
Pricing

Understanding energy pricing requires an understanding of the transformation process and the role of bottlenecks.

It also requires an understanding of the role of the price system.
The Role of the Price System

- A competitive price system aggregates the information held by millions of economic actors.
- Competitive prices adjust to direct resources to their highest value uses.
- In particular, they adjust to reflect relative scarcity and the importance of constraints/bottlenecks.
Pricing “Regimes”

- Prices may behave very differently over time, depending on how tightly constraints bind.
- In general, prices are more volatile when constraints bind tightly than when they do not.
The Economics of Pricing Regimes

Very straightforward supply and demand economics explains this

Supply is “inelastic” when constraints bind

Binding constraints mean that it’s very costly to adjust production or consumption in response to demand and supply shocks

In these circumstances, prices must bear the burden of adjustment
Example: Midwest Gas Pricing

- Midwest gas pricing has been very controversial recently (since late-1990s)
- Several FTC investigations
- Simple supply and demand analysis can shed light on why pricing behavior has changed
- Role of environmental regulations—supply less elastic
Example: NOX Permits

- CA enacted restrictions on NOX emissions from power plants
- Due to heavy operations in summer of 2000, many plants had come close to reaching their allowed emissions
- NOX permits became a bottleneck
Derived Demand

Demand for products further back in the marketing chain “derived from” demand for final products—e.g., demand for oil is derived from demand for gasoline, heating oil, plastics, etc.

Bottlenecks determine how shocks upstream and downstream impact prices along the chain.
Implication of Derived Demand

The same shock (e.g., an increase in the demand for gasoline) can have a different impact on the demand for (and hence pricing of) crude oil depending on the amount of slack in refining.
Spreads Price Bottlenecks

- Transmission/congestion charges price transmission bottlenecks (example: PJM)
- Price of NG transportation and storage prices pipeline and storage bottlenecks
- Crack spread
- Spark spread
- Basis
Trading

- Spreads and pricing relationships are the essence of much commodity trading.
- Trading and managing the risk of such price exposures requires an understanding of the value chain.
- There is a big potential payoff to understanding the intricacies of the value chain.
Suppression of Markets and Price Signals

- Sometimes (particularly in power markets, it seems) markets are missing (by accident or design) or price signals are suppressed.
- Zonal pricing in power markets.
- Price caps (electricity, gasoline in the bad old days).
- Absence of markets means that some bottlenecks are “free”.
- People expend resources to get “free lunches”.
Market Power

The foregoing analysis has presumed that everybody is a price taker—competitive markets.

Some players may be “price makers”

These players can influence prices—that is, they can exercise market power—by withholding output from the market.
The Effects of Market Power

- Prices can spike in competitive markets.
- Market power can lead to higher prices, but prices can be high without market power.
- Market power sometimes hard to diagnose—not so hard at other times.
- Policies that make no sense when there is no market power (e.g., price caps) may be sensible when market power exists.
Market Power and Bottlenecks

- Bottlenecks can create or enhance market power
- Less competition behind bottleneck
- Midwestern gasoline redux
- Market power per se is not illegal
- Collusion
- Manipulation