Manipulation of day-ahead electricity prices through virtual bidding

Chiara Lo Prete

Harvard University Center for the Environment

December 9, 2013

CONSORTIUM FOR

Energy Policy Research at Harvard

HARVARD Kennedy School

MOSSAVAR-RAHMANI CENTER
for Business and Government

"FERC amps up market enforcement"

Types of violations settled
by the Federal Energy Regulatory Commission,
FY 2013

Market manipulation cases
settled in FY 2013

- Natural gas transportation
- OATT
- Reliability standards
- Market manipulation
- Market-based rate violations
- Hydro licensing
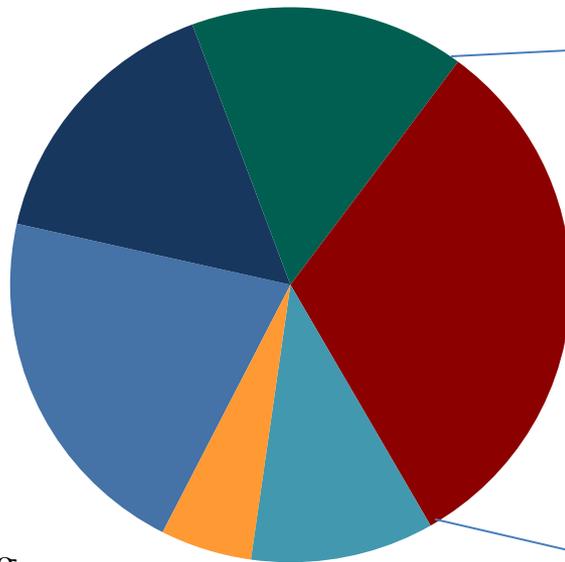
Civil penalties: 304 million $
Disgorgement: 141 million $

	Civil penalties ('000 $)	Disgorgement ('000 $)
JP Morgan Ventures Energy Corporation	285,000	125,000
Enerwise	780	21
Rumford Paper Company	10,000	2,836
Oceanside Power	51	29
Deutsche Bank Energy Trading	1,500	172
Gila River Power	2,500	911
Total	**299,831**	**128,969**

Source: U.S. Federal Energy Regulatory Commission, 2013 Report on Enforcement.

The Deutsche Bank case

> ➢ "DB violated the Commission's anti-manipulation rule through cross-product manipulation in which it traded physical exports at Silver Peak that were not profitable with the intent to benefit its CRR position." (FERC, 2013 Staff Report on Enforcement)
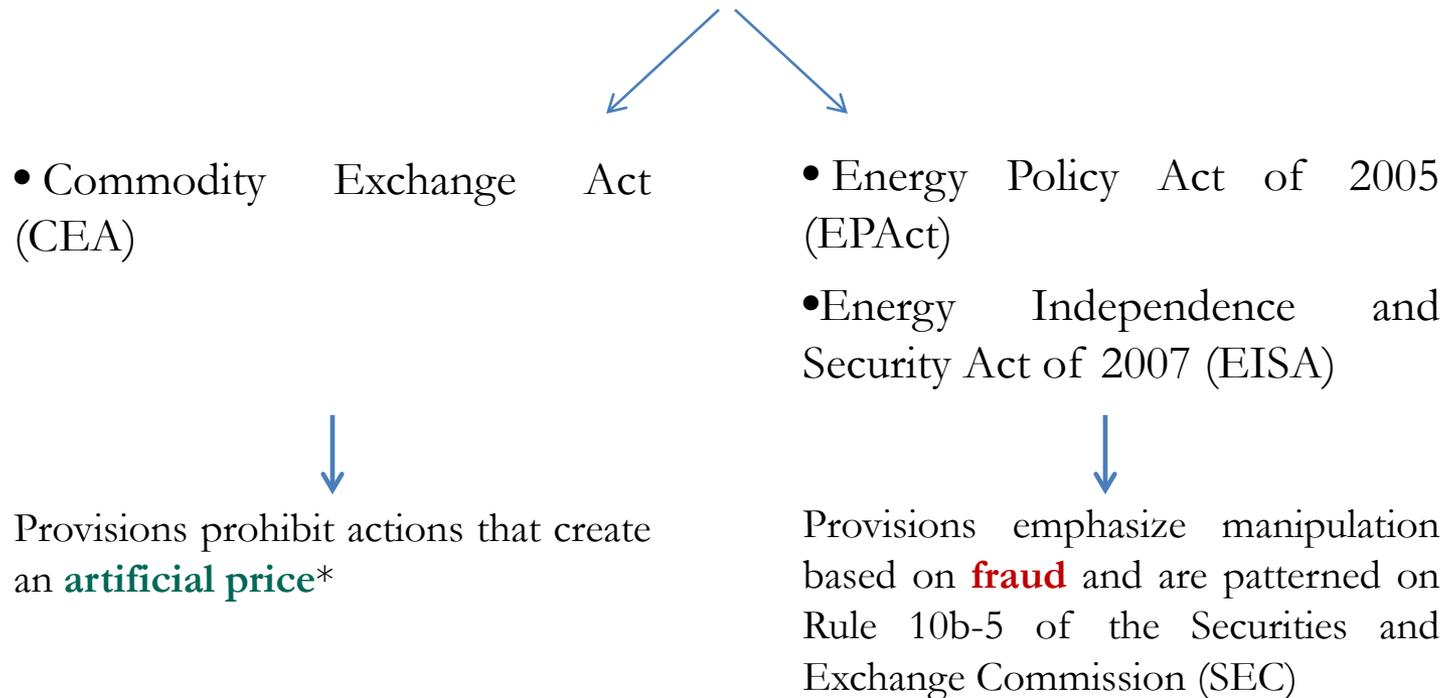
Other cases involving uneconomic trading to benefit financial positions

➢ Constellation Energy Commodities Group: settled in March 2012 (civil penalties: 135 million $, disgorgement: 110 million $)

- "The effective date of this agreement shall be the later of the date on which: (a) the Commission issues an order approving this agreement without material modification; or (b) the merger pursuant to the agreement and plan of merger among Constellation Energy Group, Exelon Corporation and Bolt Acquisition Corporation is consummated." (Order approving stipulation and consent agreement, 138 FERC 61,168, Par. 44)

➢ Barclays Bank: currently being litigated

- In July 2013, FERC assessed civil penalties of 435 million $ against Barclays (plus disgorgement of 35 million $)

- The four traders face a combined 18 million $ in civil penalties

Manipulation of energy markets in the U.S.
Federal statuses

➢ Three federal statutes prohibit manipulation of energy commodities in the U.S.

- Commodity Exchange Act (CEA)

- Energy Policy Act of 2005 (EPAct)
- Energy Independence and Security Act of 2007 (EISA)

Provisions prohibit actions that create an **artificial price***

Provisions emphasize manipulation based on **fraud** and are patterned on Rule 10b-5 of the Securities and Exchange Commission (SEC)

*An artificial price is defined as "a price which does not reflect basic forces of supply and demand" (Cargill vs. Hardin, Eighth Circuit, 1971).

Manipulation of energy markets in the U.S.
Enforcement agencies

➤ Two agencies claim jurisdiction in most cases regarding manipulation of energy markets in the U.S.

- Commodity Futures Trading Commission (CFTC)

Jurisdiction over "any swap, or contract of sale of any commodity, or contract for future delivery on or subject to the rules of any regulated exchange or trading facility"

CFTC's original anti-manipulation rule, modeled after Section 6(c) of the CEA, required proof of **artificial price***

- Federal Energy Regulatory Commission

Jurisdiction over wholesale sales and transmission of electric energy in interstate commerce; natural gas and oil pipeline transportation rates and services

FERC's anti-manipulation rule, modeled after SEC's Rule 10b-5, requires proof of the existence of a **fraudulent** intent

*The CFTC's rule has been expanded with the addition of a provision that prohibits fraud-based manipulation after the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act in 2011

Manipulation of energy markets in the U.S.
FERC's anti-manipulation rule (Title 18 C.F.R. § 1c)

➤ It is unlawful for any entity, directly or indirectly, in connection with the purchase or sale of products subject to FERC jurisdiction,

(1) To use or employ any device, scheme, or artifice to defraud[*];

(2) To make any untrue statement of a material fact or to omit to state a material fact necessary in order to make the statements made, in the light of the circumstances, not misleading; or

(3) To engage in any act, practice, or course of business that operates or would operate as a fraud or deceit upon any entity.

[*] FERC defines fraud as "any action, transaction, or conspiracy for the purpose of impairing, obstructing or defeating a well-functioning market" (Order No. 670, Par. 50).

Manipulation of energy markets in the U.S.
Concerns and questions

➢ FERC's anti-manipulation rule is broadly framed and fraud-based

➢ Enforcement settlements contain little information → what is FERC's framework for the analysis of market manipulation?

➢ How can energy traders affect electricity prices over a sustained period of time?

A possible framework for the analysis of day-ahead market manipulation through virtual bidding
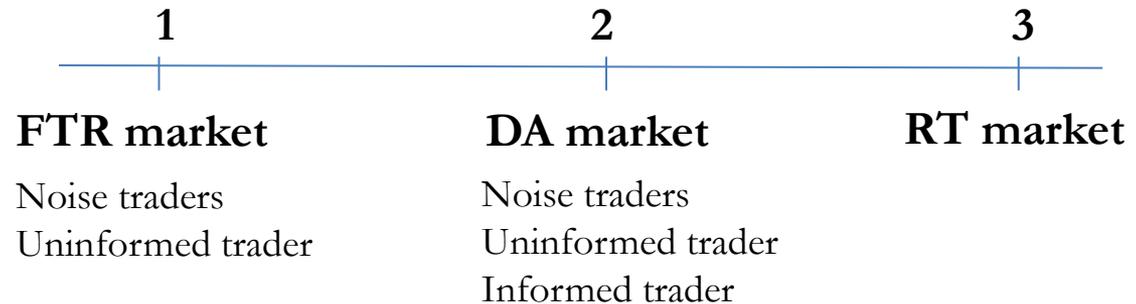
```
                    ┌─────────────────────┐
                    │   DAY-AHEAD (DA)     │
                    │  MARKET CONDITION    │
                    └─────────────────────┘
                       ↓              ↓
          ┌──────────────────┐   ┌──────────────────────────┐
          │   EQUILIBRIUM    │   │      DISEQUILIBRIUM      │
          └──────────────────┘   │ Example: Ledgerwood and  │
             ↓          ↓        │  Pfeifenberger, 2012     │
                                 └──────────────────────────┘
   ┌──────────────────┐   ┌──────────────────┐
   │  PRICE-SETTING   │   │   PRICE-TAKING   │
   └──────────────────┘   └──────────────────┘
      ↓          ↓                 ↓
                          ┌──────────────────┐
                          │  NO MANIPULATION │
                          └──────────────────┘
```

RELATED FINANCIAL POSITIONS

NO RELATED FINANCIAL POSITIONS
(Kyle, 1985)

UNECONOMIC DA POSITIONS

ECONOMIC DA POSITIONS

NO MANIPULATION

LEVERAGE > 1

LEVERAGE <= 1

MANIPULATION
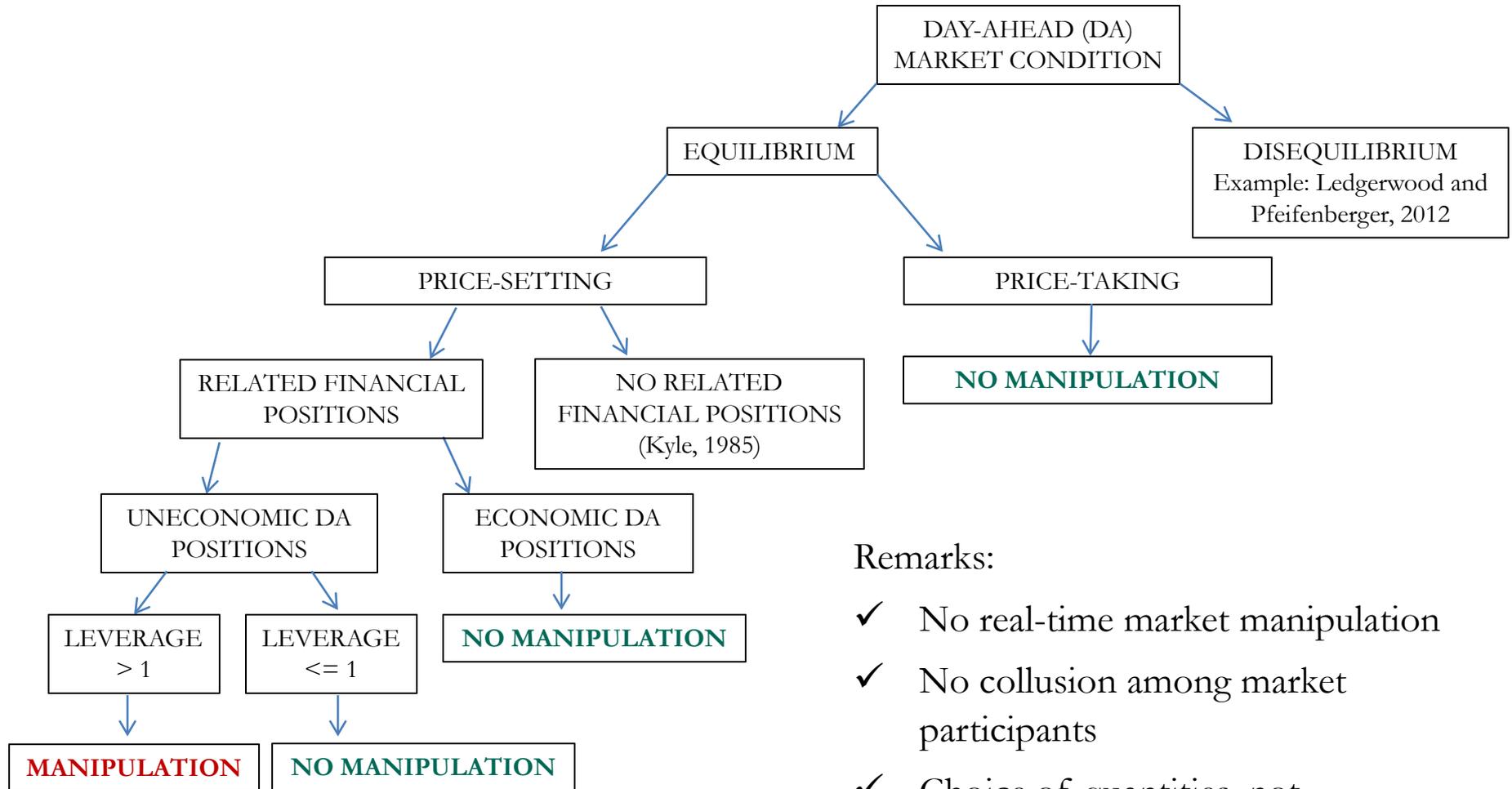
NO MANIPULATION

Remarks:

- ✓ No real-time market manipulation
- ✓ No collusion among market participants
- ✓ Choice of quantities, not supply/demand functions

Application of
Kumar and Seppi (1992)

	1	**2**	**3**
	FTR market	**DA market**	**RT market**
	Noise traders	Noise traders	
	Uninformed trader	Uninformed trader	
		Informed trader	

Noise traders' position	$e \sim N\,(0,\sigma^2_e)$	$u \sim N\,(0,\sigma^2_u)$	
Uninformed trader's position	$\Delta \sim N\,(0,\sigma^2_W)$	z	
Informed trader's position		x	
Aggregate position	$y1f = e + \Delta$	$y2s = x+u+z$	
Price	F	S	$v \sim N\,(\mu,\sigma^2_v)$

➤ The uninformed trader manipulates the DA price

➤ Manipulator's problem:
$$\text{Max}_\Delta \ E_e \{\text{Max}_z \ E_{v,u,x} \{\Delta[S(y1f, y2s) - F(y1f)] + z[v - S(y1f, y2s)] \mid y1f\}\}$$
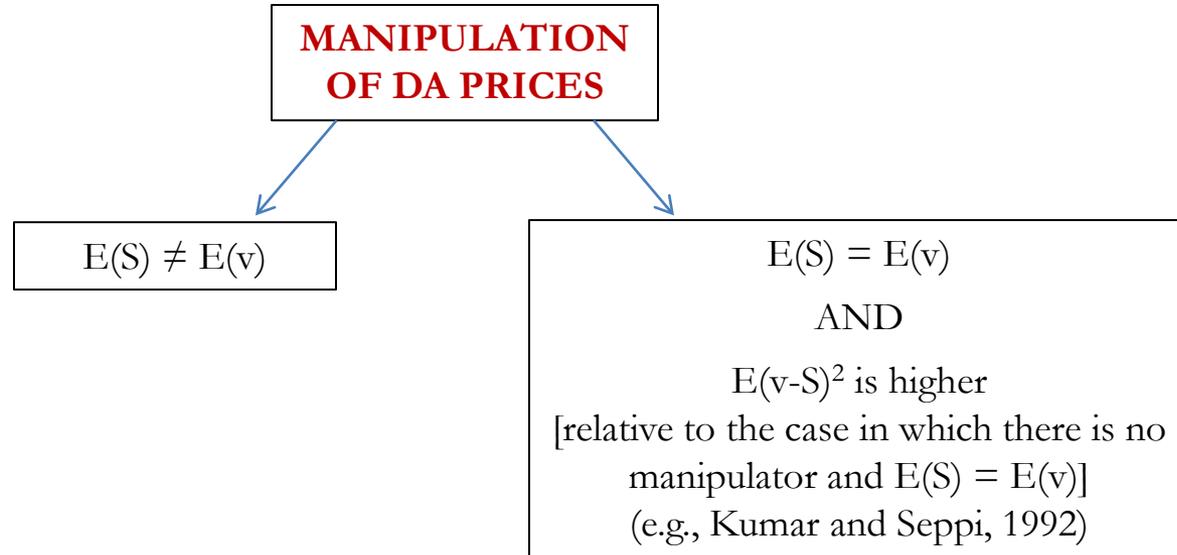s.t. $|\Delta| \le |W|$

Application of
Kumar and Seppi (1992)

➢ There exists a unique equilibrium in which the manipulator:

- Randomizes its trading strategy in the FTR auction with equal probability (i.e., goes long |W| or short -|W| FTR positions at date 1), and then trades in the DA market

- Loses (on average) on its DA position

- Gains on its FTR position

If the manipulator's FTR position (Δ) is larger than its expected position on the DA market [E(z|e+Δ)], the overall manipulation strategy is profitable

$$S = E(v) + \lambda[y2s - E(y2s|y1f)]$$

$$E(S) = E(v)$$

Types of equilibrium manipulation

```
           ┌──────────────────────┐
           │   MANIPULATION       │
           │   OF DA PRICES       │
           └──────────────────────┘
              ↙              ↘
```

$E(S) \neq E(v)$	$E(S) = E(v)$ AND $E(v-S)^2$ is higher [relative to the case in which there is no manipulator and $E(S) = E(v)$] (e.g., Kumar and Seppi, 1992)
Empirical implications	Price differential bounded by entry costs	✓Randomized trading strategies on the FTR market → CREDIBLE? ✓Corr(Δ, S) > 0