Moderating Price Volatility By Adding Market Controls: Unintended Consequences

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Presentation Outline

Concerns
- Prices will exceed acceptable levels
- Prices will fall and not incent innovation
- Systemic risk
- No transparency
- Allowance bubbles
- Manipulation

Considered Limits
- Price ceiling
- Price Floor
- Prohibit Derivatives
- Prohibit Speculators
For more information


Implementing Price Control Through Supply Management

New Allowances = X

Removed Allowances = X
Price Ceilings and Floors (a.k.a. the Safety Valve)
Behavioral Effects of Price Controls

- Price behavior near the ceiling/floor
  - Krugman, (QJE, 1991)
  - Target zone has stabilizing effect if credible zone

- If not credible: Speculative attacks at exchange rate target zone floor
  - Mexican Peso (Dec 22, 1994), Thai Baht (July 2, 1997), Malaysian Ringgit (July 14, 1997), English Pound (Sept 16, 1992)
  - Volatility near boundary increases as you introduce uncertainty about credibility of government to maintain boundary

- Likely that allowance price ceiling can be credible, given de minimis cost of printing allowances

- Other experience with price controls
  - Tin market collapsed in 1985 because International Tin Council couldn’t maintain the floor
  - Gold prices actually increased faster given potential for unannounced price management (threat of govt release caused extractors and speculators to require a higher rate of return to hold gold)
  - California Electricity Prices (price ceiling)
The Carbon Market Context

- Waxman-Markey (HR2454) - Strategic Reserve
  - Price Ceiling ($28) and Price Floor ($10) rising at 5% real (2009$)

- Kerry-Boxer (S1733) – Market Stability Reserve
  - Price Ceiling ($28) and Floor ($10) escalate at 5% real (KB ceiling 7% after 2017) (2005$)

- Kerry-Lieberman – Cost Containment Reserve
  - Price ceiling ($25) and Floor ($12) rising at 5% and 3% real, respectively (2009$)

- Nature of Supply for maintaining price ceiling
  - Sources of Supply (New / Taken from Future)
  - Size of Release (Limited / Unlimited)
  - Replenishing Allowances taken from future (Replace / Do not Replace)
Price Path Asymmetry

Price

\( p_e \)

\( t_1 \) \hspace{1cm} \( t_2 \) \hspace{1cm} \( t_3 \) \hspace{1cm} \( t_4 \) \hspace{1cm} \( t_5 \)

Time

Price

Supply

\( p_c \)

\( p_e \)

\( p_f \)

Price Ceiling

Price Floor

Marginal Abatement Costs

Emissions
Price Path Asymmetry

Price

Emissions

Marginal Abatement Costs

$p_e$

$t_1 \ t_2 \ t_3 \ t_4 \ t_5$

Time

$Z$

Emissions

$Z$

$Z$

$Z$

$Z$

$Z$

Supply

Price Ceiling

$p_c$

$P_e$

$p_e$

$P_f$

Price Floor

Marginal Abatement Costs
Price Path Asymmetry

$p_e$

$t_1$ $t_2$ $t_3$ $t_4$ $t_5$

$Z$ $Z + \Delta$

Marginal Abatement Costs

Price

$p_c$ Price Ceiling

$p_e$ Price Floor

$p_f$

Supply

Emissions
Price Path Asymmetry

$p_e$

$t_1 \quad t_2 \quad t_3 \quad t_4 \quad t_5$

Time

$Z + \Delta$

Emissions

Price

$p_c$

$p_e$

$p_f$

Supply

Price Ceiling

Price Floor

Marginal Abatement Costs
Price Path Asymmetry

$p_e$

$t_1 \quad t_2 \quad t_3 \quad t_4 \quad t_5$

$Z + \Delta$

Price

Supply

Price Ceiling

Price Floor

Marginal Abatement Costs

$p_c$

$p_e$

$p_f$
Price Path Asymmetry
Price Path Asymmetry

- $p_e$ (Price)
- $t_1, t_2, t_3, t_4, t_5$ (Time)
- $Z + \Delta$ (Emissions)
- $p_c$ (Price Ceiling)
- $p_f$ (Price Floor)
- Extra cost for some allowances
- Savings on remainder of allowances
- Marginal Abatement Costs

Graph showing the price path asymmetry with supply, price ceiling, price floor, and emissions plotted against time.
Application to the carbon market?

- Are there ways to manipulate the market given potential designs of the price ceiling?
  - YES, but depends on specific design
- Is there a financial benefit to be had from manipulating the market?
  - POSSIBLY, depends on conditions, elasticities, and market structure
- Can the manipulation be implemented unilaterally or is a coalition needed?
  - MAYBE, depends on market structure
## Deviation Modeling Results

<table>
<thead>
<tr>
<th>Planning Horizon (PH)</th>
<th>No. Allowances Issued Over PH (millions)</th>
<th>Coalition (%)</th>
<th>Deviation (as % of Coalition Demand over PH)</th>
<th>Deviation (as % of Coalition Demand in 1st Yr)</th>
<th>Cost with No Deviation ($ billions)</th>
<th>Cost of Deviation Investment ($ billions)</th>
<th>Cost Under Deviation (excl. dev. Allowances ($ billions))</th>
<th>Annualized Effective Real Return on Deviation Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>15,000</td>
<td>5</td>
<td>10</td>
<td>30</td>
<td>$18</td>
<td>$0.45</td>
<td>$17.7</td>
<td>11-16%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>$36</td>
<td>$0.90</td>
<td>$33.6</td>
<td>41-46%</td>
</tr>
<tr>
<td>5</td>
<td>25,000</td>
<td>5</td>
<td>10</td>
<td>50</td>
<td>$30</td>
<td>$0.75</td>
<td>$29.0</td>
<td>7-10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>50</td>
<td>$60</td>
<td>$1.50</td>
<td>$56.0</td>
<td>23-26%</td>
</tr>
<tr>
<td>10</td>
<td>50,000</td>
<td>5</td>
<td>10</td>
<td>100</td>
<td>$60</td>
<td>$1.50</td>
<td>$58.0</td>
<td>4-6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>100</td>
<td>$120</td>
<td>$3.00</td>
<td>$111.9</td>
<td>12-13%</td>
</tr>
</tbody>
</table>

Price Floor

- Intended to increase the stringency of the cap when the price approaches the floor

- Implementation
  - Introduce new allowances with reserve price (auction)
  - Program administrator stands ready to buy at floor price (credibility issues?)

- Design of the Price Floor
  - Floors rise at a given real rate (5% WM/KB, 3% KL)

Price Floors
(Escalation Rate > Risk Free Rate)

Result: Escalation rate of floor could become large determinant of allowance prices
Price Floors
(Black-Scholes Put Option for Floor Allowances)

Result: Floor does not tighten overall cap, just shifts reductions forward in time.
Part II:  Limits to Speculators and Derivatives

Addressing concerns about:
1) Systemic risk;
2) Lack of transparency;
3) Allowance bubbles; and
4) Manipulation

Limiting Market Participation

- **Benefits of speculators**
  - Increased liquidity
    - Lower bid/ask spreads
    - Speculator decision to buy/sell not correlated with covered entity need to buy/sell allowances
  - More information (from diverse sources)
    - Profit from bringing accurate information to the market
  - Holding banked allowances
    - Banked allowances tie up capital
    - Speculators have lower cost of capital (no/limited corporate income taxes) relative to covered entities
Two Firms: Two Capital Costs

Result: Allowance prices expected to rise slower when held by speculator, or firm with lower cost of capital.

Covered Entity Cost of Capital = Competitive Rate + Tax Rate

Speculator Cost of Capital = Competitive Rate

Corporate Tax Wedge
Prohibiting Speculators

- Reduced liquidity and increased volatility
  - If a few participants accounted for large fraction of market, increased ease of manipulation
- Removing class of traders who profit by providing services to market would create profit incentive for remaining traders
  - Or create incentive for excluded traders to purchase small covered entity
- Increased concentration of risk by covered entities could have unintended consequences
- Enforcement difficult
Alternatives to Prohibiting Speculators

- Position limits
  - Expanded use under Dodd-Frank
- Circuit breakers
  - Expanded use following May 6, 2010 flash crash
Limiting Transactions

- Some proposals to limit derivatives
- Benefits of derivatives
  - Allowance derivatives allow covered entities to manage price volatility risk
    - Lower transaction costs than buying allowances and holding them
  - Short sales could dampen/reduce bubble formation
Possible Market Responses to Derivatives Prohibition

- Hedge risk using correlated commodities (e.g., natural gas or oil)
  - Not prefect hedge
  - Introduces other asset variability into allowance prices
- Move allowance derivatives to overseas markets outside U.S. regulatory authority
- Enforcement difficulty
Alternatives to Prohibiting Derivatives

- Reliance on Centralized Clearing
  - Heightened market transparency and stability
- Trading Through Formal Exchanges
  - Increased transparency and standardization
- Increased Regulation of Over-the-Counter Trading
  - Improved tracking
  - Increased margin requirements
Thank you!

All of CBO’s work on climate change is available at:
www.cbo.gov/link/cc
Prices simulated by random draws