A Variance Screen for Collusion

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Collusion Screens

- Desirable features of a screen
  - Low false positives
  - Low false negative
  - Practicable (easy to implement)
  - Costly to avoid, even if screen known

- Existing Screens
  - High prices (compared to what?)
    - But costs hard to observe (FTC’s Gasoline price screen)
  - Identical, complementary, or exchangeable bids
## Differences Across Regimes: Collusion vs. Competition

<table>
<thead>
<tr>
<th>Metric</th>
<th>Collusion</th>
<th>Competition</th>
<th>Difference Across Regimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Std. Dev. Ratio Std.Dev(P)/Std.Dev(C)</td>
<td>0.68</td>
<td>1.66</td>
<td>Collusion = Competition/2.45</td>
</tr>
<tr>
<td>Smoothness Coefficient(π/2) Price relative to Cost</td>
<td>-1.97</td>
<td>0.28</td>
<td>Collusion = Competition - 2.21</td>
</tr>
</tbody>
</table>
Salient Features of Conspiracy

- Price decreased by 23%
- Standard deviation increased by 145%
- Which should we use as a screen?
- Theory: Collusion and Variance
  - Cost of coordinating price changes
  - Agency Costs (Athey, Bagwell, Sanchiro)
Smoothness

- **Definition**: long run (low-frequency) variation relative to short run (high-frequency) variance
- **Theory**: a cost to coordinating changes means that conspiracies respond only to low-frequency changes → smoothness in price
- But smoothness increased
  - Induced by smoothness in cost series
Gasoline Price Data

- Wholesale and retail
- Only 140 out of 400 retail stations
  - Missing stations
- Few price series continuous
Gas Station Retail Price Variance

Louisville, KY Gas Stations - Retail Variances
Wholesale Price Variance

Louisville, KY Gas Stations - Wholesale Variances

Variance Legend:
- 270 to 314 (2)
- 360 to 270 (17)
- 252 to 280 (30)
- 249 to 252 (67)
- 204 to 249 (11)

US Highway

Legend:
- Circle: 270 to 314
- Triangle: 252 to 280
- Square: 249 to 252
- Diamond: 204 to 249

Scale:
- 0
- 5
- 10

Miles

Maps:
- Indiana
- Kentucky
- Clark
- Oldham
- Henry
- Shelby
- Spencer
- Bullitt
- Hardin
- Nelson
- Floyd
- Harrison
- Needle
- I-64
- I-65
- I-71

Legend:
- Variances
- Miles
- Outdoor
- Indoor
- Commercial

Legend:
- 270 to 314 (2)
- 360 to 270 (17)
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Screen Results

- No pockets of low retail price variation indicative in Cincinnati
- Not much variation in wholesale variance.
  - Explained by station ownership