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# Preliminary Econometric Results on Price Formation in the NYISO

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Insight in Economics™

# Basic Methodology Recap

- Demand changes much more quickly than supply; therefore, when we see demands change, the observed prices trace out a supply curve for electricity. So the basic relationship is P=f(Load,Fuel Price)
- But there are numerous shifters which cause this relationship not to be completely determined
  - Maintenance
  - Network Conditions
  - Unit Conditions
  - Outages
  - Ambient Temperature

# Basic Methodology Recap

- Many of these shifters can be incorporated into so-called “fixed effects,” moves in the supply curve which are consistent; month, hour, etc.
- The network topology gives independent effects to zonal loads and NYISO-loads. Interactions between zonal and aggregate loads also appear to be important
- Other important shifters involve costs; important drivers here are gas prices and temperature

# The Data

- Hourly Dayahead LBMP, by Zone, from 11/1/2006-10/31/2009
- Daily (Interpolated) Gas Prices, Transco and Tetco
- Temperature (Min, Max, Avg) at Central Park and Albany Airport
- Hourly Integrated Loads by Zone
- ICAP Reserve Margins from NYISO, Monthly, by Region

# Price Summary

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| zone name | Summary of zonal lbmp Mean | Std. Dev. | Freq. |
|---|---|---|---|
| CAPITL | 65.813859 | 27.609667 | 26307 |
| CENTRL | 54.891333 | 22.536366 | 26307 |
| DUNWOD | 69.49612 | 32.775353 | 26307 |
| GENESE | 51.671846 | 21.992576 | 26307 |
| HUD VL | 68.217762 | 30.945045 | 26307 |
| LONGIL | 80.236664 | 37.889552 | 26307 |
| MHK VL | 56.923734 | 23.606058 | 26307 |
| MILLWD | 69.297512 | 32.653368 | 26307 |
| N.Y.C. | 74.587041 | 35.85477 | 26307 |
| NORTH | 53.459046 | 22.758804 | 26307 |
| WEST | 48.789367 | 20.6538 | 26307 |
| Total | 63.034935 | 30.371785 | 289377 |

# And A Sense of the Distribution

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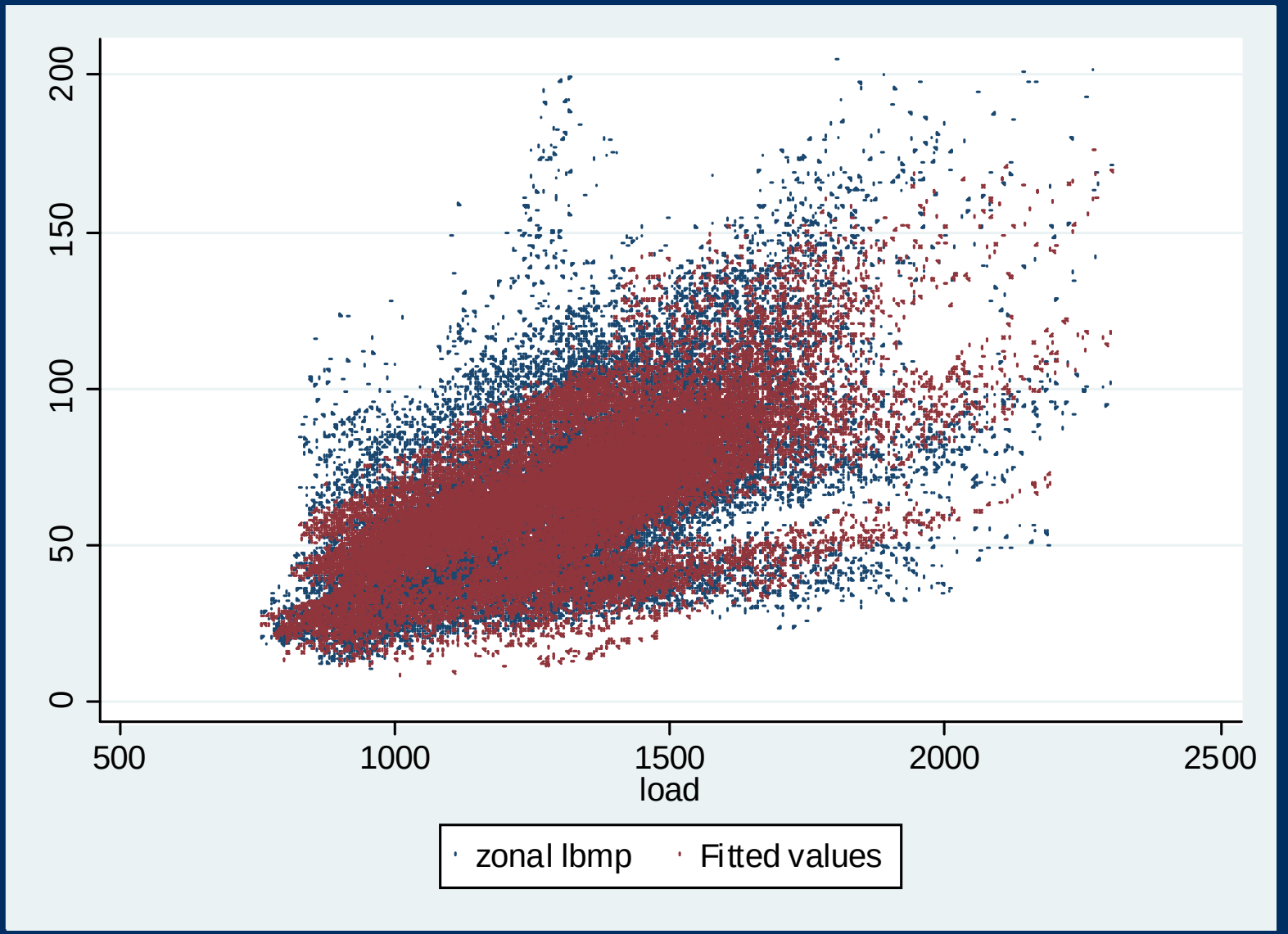
## Capital Zone

| | Percentiles | Smallest | | |
|---|---|---|---|---|
| 1% | 20.61 | 10.33 | | |
| 5% | 28.43 | 12 | | |
| 10% | 33.49 | 12.05 | Obs | 26307 |
| 25% | 43.72 | 12.09 | Sum of Wgt. | 26307 |
| 50% | 63.91 | | Mean | 65.81386 |
| | | Largest | Std. Dev. | 27.60967 |
| 75% | 81.3 | 200.37 | | |
| 90% | 101.73 | 201.28 | Variance | 762.2937 |
| 95% | 115.53 | 201.99 | Skewness | .8437746 |
| 99% | 149.12 | 205.19 | Kurtosis | 4.130292 |

## New York City

| | Percentiles | Smallest | | |
|---|---|---|---|---|
| 1% | 20.96 | 10.61 | | |
| 5% | 29.32 | 12.23 | | |
| 10% | 35.88 | 12.27 | Obs | 26307 |
| 25% | 48.23 | 12.35 | Sum of Wgt. | 26307 |
| 50% | 69.69 | | Mean | 74.58704 |
| | | Largest | Std. Dev. | 35.85477 |
| 75% | 91.74 | 357.87 | | |
| 90% | 120.14 | 363.21 | Variance | 1285.564 |
| 95% | 140.97 | 367.55 | Skewness | 1.422025 |
| 99% | 188.89 | 373.61 | Kurtosis | 7.208233 |

# The Capital District Predicted



# The Current Model

$$LBMP = \alpha + \sum_{zones}\left(\beta_i Load_i + \gamma_i Aggload \cdot Load_i\right) +$$
$$\sum_{regions}\left(\delta_i Aggload + \lambda_i Aggload^2 + \theta_i Aggload^3\right) +$$
$$\sum_{months,hours}\varphi_i \ln(gasprice) + \sum_{months,regions}\kappa_i rm + \sum_{hours,months}\varsigma_i +$$
$$\sum_{dayofweek}\varphi_i + \sum_{zones}\eta_i + \tau \cdot t\max + \nu \cdot t\min + \phi \cdot tavg + \varepsilon$$

# All Zones Fit Quite Well

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| zone name | Summary of r2<br>Mean |
|---|---|
| CAPITL | .82258981 |
| CENTRL | .82123756 |
| DUNWOD | .87535828 |
| GENESE | .76631147 |
| HUD VL | .87203217 |
| LONGIL | .84523195 |
| MHK VL | .82563668 |
| MILLWD | .8757121 |
| N.Y.C. | .84718543 |
| NORTH | .77784979 |
| WEST | .74603528 |
| Total | .82501641 |

# Issues Remain

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- Reserve margin effects are weak; active efforts to sharpen them
- Maximum temperature switched signs; more investigation needed, but seems to involve relationship between average and max
- Still investigating the use of log LBMP instead of LBMP. Mostly accounted for in the use of nonlinear load terms, but investigations continue
- General tweaking to improve fit, but not too much

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