Scenario Development Working Group

ERCOT's Long-Term Load Forecast Model

ERCOT

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Outline

- **Linear Regression Assumptions**
  - heteroscedasticity
- **ERCOT's Long-Term Load Forecast Model**
- **Adjustments to the Long-Term Forecast**

Linear Regression Assumptions [1]

Quantitative models always rest on assumptions about the way the world works, and regression models are no exception. There are four principal assumptions which justify the use of linear regression models for purposes of prediction:

i. **linearity of the relationship between dependent and independent variables**
ii. **independence of the errors (no serial correlation)**
iii. **homoscedasticity (constant variance) of the errors**
    i. versus time
    ii. versus the predictions (or versus any independent variable)
iv. **normality of the error distribution.**

[1] http://www.math.canterbury.ac.nz/~m.reale/econ324/Topic2.pdf

Linear Regression Assumptions [1]

- **If any of these assumptions is violated (i.e., if there is nonlinearity, serial correlation, heteroscedasticity, and/or non-normality), then the forecasts, confidence intervals, and economic insights yielded by a regression model may be (at best) inefficient or (at worst) seriously biased or misleading.**

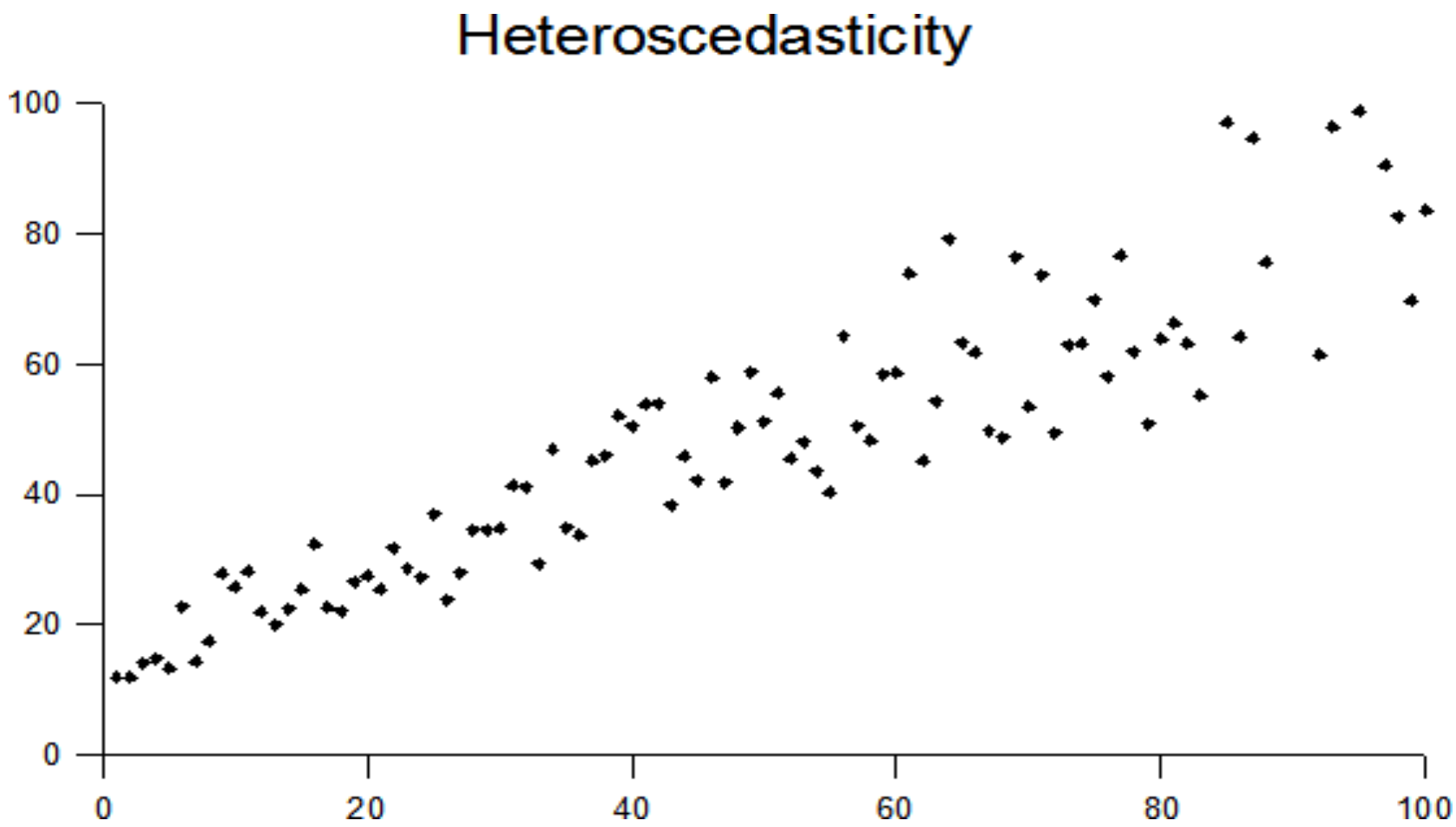
[1] http://www.math.canterbury.ac.nz/~m.reale/econ324/Topic2.pdf

Heteroscedasticity

- **What is heteroscedasticity?**

- **Heteroscedasticity occurs when the variance of the error terms differ across observations.**

Heteroscedasticity Example



Long-Term Load Forecast Model Description

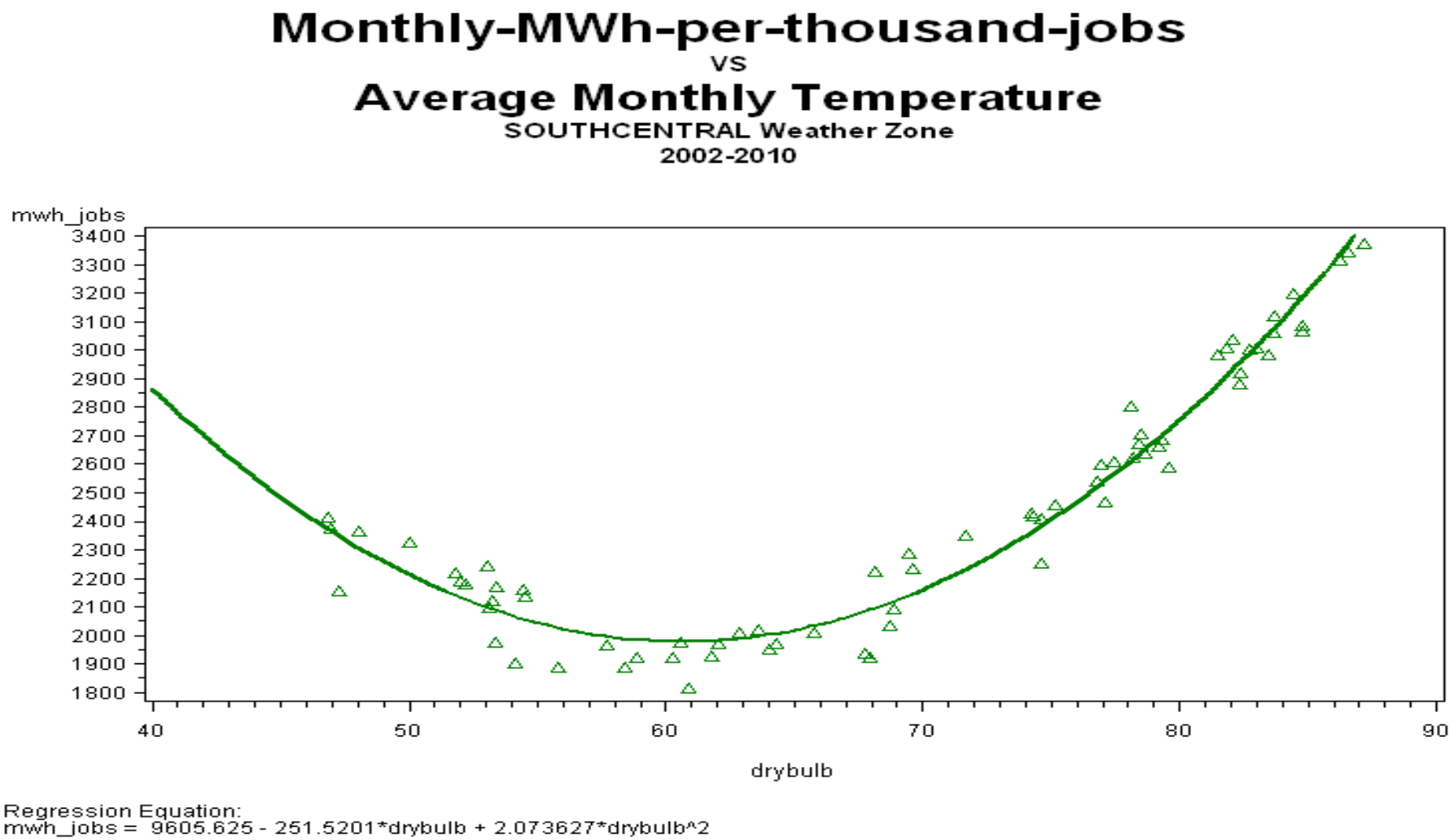
- **Each weather zone has its own independent model (there are eight weather zones in ERCOT).**
- **The eight weather zone forecasts are summed to create the ERCOT load forecast.**
- **Each model forecasts monthly MWh per one thousand jobs (based on non-farm employment).**
- **Selected this modeling approach due to concerns of heteroscedasticity.**

Long-Term Load Forecast Model Description

- **Monthly MWh per one thousand non-farm employment jobs is estimated using a second order equation that has weather data (i.e., average monthly temperature) as the independent variable.**

- **Other independent (dummy) variables include year and month.**

Model Example for the South Central Weather Zone



Regression Equation:
mwh_jobs = 9605.625 - 251.5201*drybulb + 2.073627*drybulb^2

Adjustments to the Long-Term Forecast

- **Energy Efficiency**
  - An independent model will be used to quantify MWh of energy efficiency. The forecasted MWh of energy efficiency is subtracted from the long-term load forecast.

- **Demand Response**
  - An independent model will need to be created to quantify MW of demand response. The forecasted MW of demand response will be subtracted from the long-term demand forecast.

Adjustments to the Long-Term Forecast

- **Distributed Generation**
- **Plug-in Electric Vehicles**
- **Other**

Questions