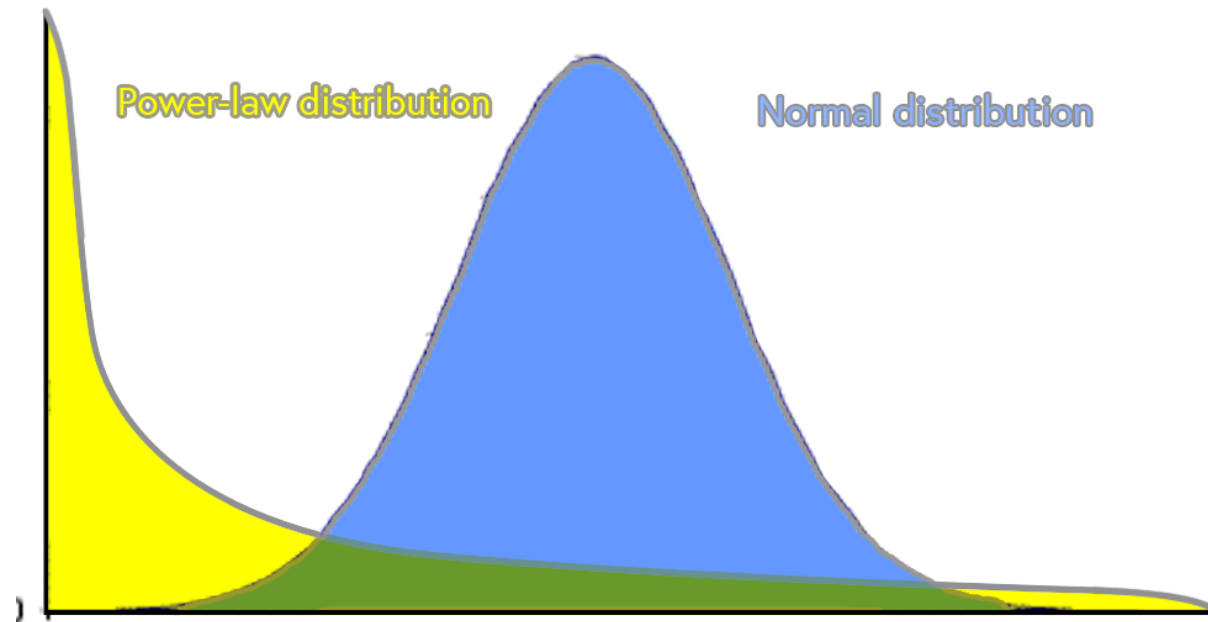# Sports Econometrics

## Predicting Dichotomous Variables with OLS

# OLS is not the answer

- OLS or Ordinary Least Squares is the only regression technique in Excel.

- There are countless other methodologies.

- OLS is very good when the data is:
  - Normally distributed
  - Continuous (with X and Y variables in a wide range, positive and negative)
  - No endogeneity concerns
  - No simultaneity concerns

# Sports Data is often not normally distributed

- Dichotomous variables (e.g. dummy variables) are never normally distributed. (Win-Loss) Binomial distribution which can approximate normal distributions under certain conditions.

- Power law distributions are also very common. (see Salary data)

# Often the Y variable is a Dummy Variable

- OLS coefficients can be read as probabilities. (0.03 = 3%)
- The results of XB can be read as the probability of the outcome Y
- But OLS doesn't like to fit 0 or 1 Y variables.
- Your forecast from XB could be greater than 100% or less than 0%
- You really need statistical techniques like Probit and Logit.

# Often the Y variable is categorical

- What if the Y outcome is the result of a drive?
  - Punt
  - Touchdown
  - Field Goal Attempt
  - Turnover
- OLS can't help here. You need to turn those outcome into dichotomous variables and run multiple OLS regressions.
- Maximum Likelihood Estimation or Bayesian can help here.

# Endogeneity and Simultaneity

- To fix endogeneity: One (or more) X variables is determined at the same time as the Y variable
  - Two stage least squares will solve this problem
- To fix simultaneity: Two (or more) Y variables are determined at the same time
  - You need Seemingly Unrelated Regressions

# The bottom line:

- You're on the cusp of having amazing job skills in Database management in Statistical analysis BUT…

- You need to take more Econometrics and Statistics classes.
  - ECON 419, MATH 250, MATH 350 AND Data Science classes
  - These hard skills turn into entry-level job offers.  Few grads and workers have these skills – you're the magician.
  - Your B-School degree makes you infinitely promotable.
  - Don't forget graduate school.