U.S. PUBLIC PENSION ASSET ALLOCATIONS

Research Question: How do fund characteristics (performance and composition) effect the asset allocations of U.S. public pension funds from 2001-2016?

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IMPORTANCE OF TOPIC

What factors influence asset allocation of U.S. public pensions?

- WHY PUBLIC PENSIONS?
  - Many U.S. public pensions are underfunded
    - In 2016, the median funding ratio (assets available for payments to retirees) was *71.1%* (Bloomberg)
    - In 2017, “US public pension funds lack $3.85tn that they need to pay the retirement benefits of current and retired workers” (Financial Times)
- WHY ASSET ALLOCATION?
  - Modern portfolio theory - reducing portfolio risk through diversified, uncorrelated assets

DATA

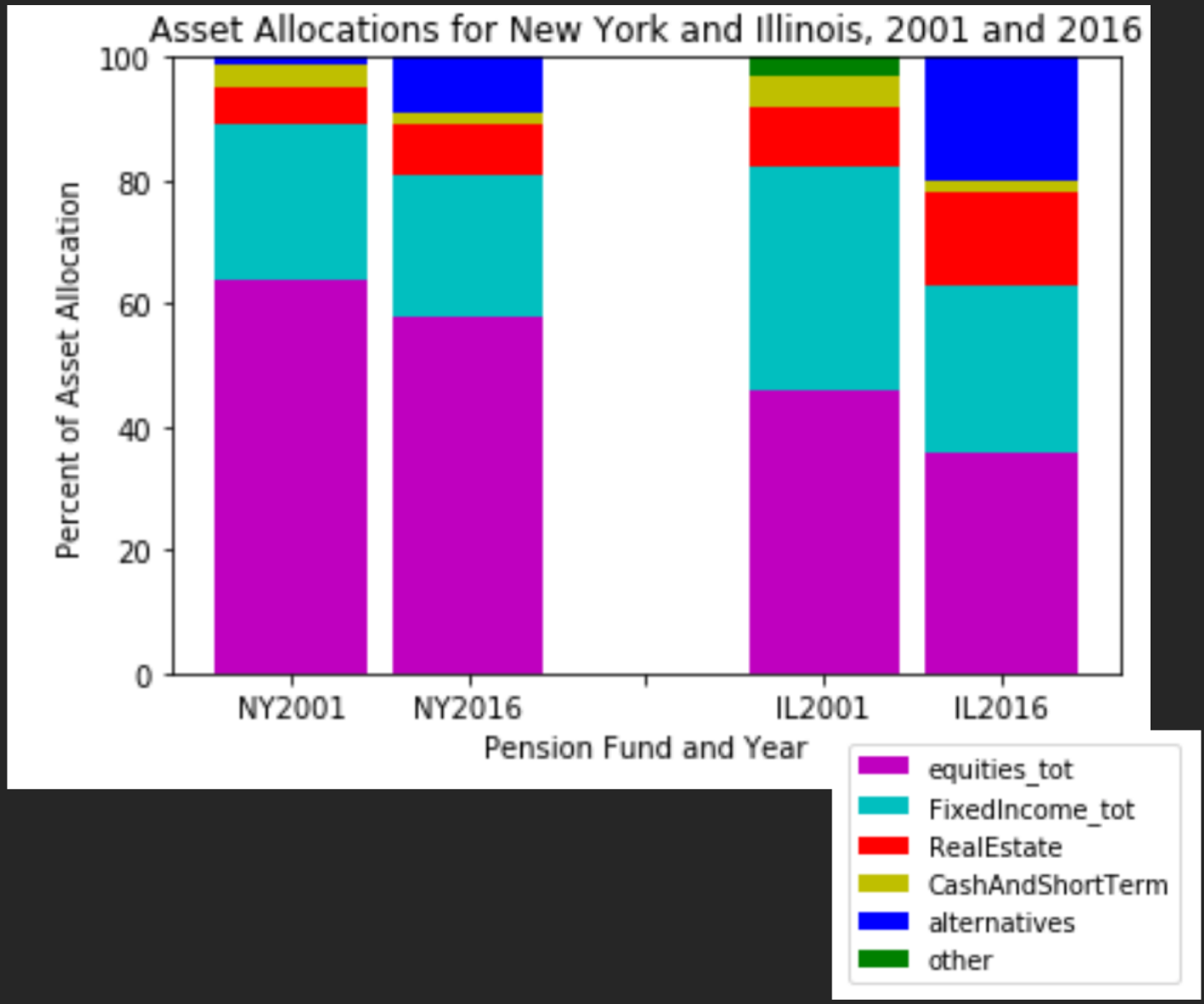
- Public Plans Database
  - Plan-level data on 170 public pension plans: 114 administered at a state level and 56 administered locally
  - Covers 2001-2016 (16 years)
  - Covers 95 percent of public pension membership and assets nationwide
  - Includes information on
    - Asset Allocation
    - Membership composition (type and quantity)
    - Funding
    - Returns
    - Etc.

VARIABLES

- Endogenous:
  - Asset Allocation
- Potential exogenous variables to consider:
  - Funded Ratio
  - Number of pensioners in plan
  - Assets under management
  - Pension industry
  - Previous year’s investment return

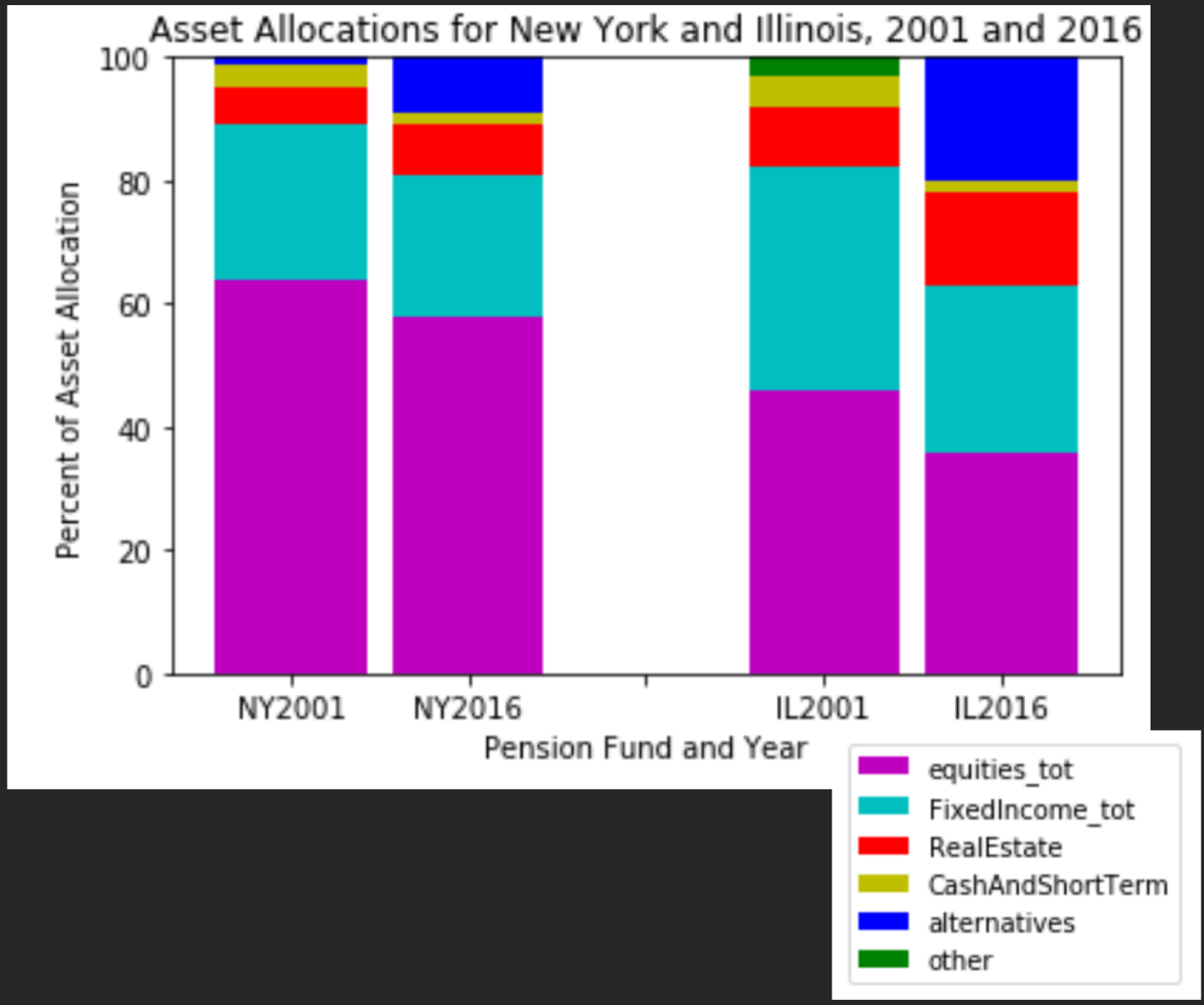
DEFINING ASSET ALLOCATION: BREAKDOWN

- % total assets invested in:
  - Equities
  - Fixed Income
  - Alternatives
  - Real Estate
  - Cash/Short-Term
  - Other
- Vary by year and plan
  - NY has higher funded ratio than IL



DEFINING ASSET ALLOCATION: CATEGORICAL?

- Operationalizing asset allocation
  - Classifier
    - High (1) and low (0) equity to fixed income ratio
  - Continuous
    - Finer-grained ratio
    - Scale of allocation profiles
  - Different Models?
    - Predict 6 categories



MODEL/THEORY

- Let’s do a horse race!
  - Logistic Regression vs. Random Forest vs. Neural Net
- Take model strengths/weaknesses into account
  - Classification vs. continuous model of asset allocation
  - Adding more features (Neural Net vs. Random Forest)

POTENTIAL ISSUES WITH MODEL

- Data is relatively small (170 obs/year)
  - Include resampling methods
- Time-Series data
  - Will need to account for changes in markets and investment strategies over time
- Omitted Variable Bias and correlations between variables
  - Need to think hard about the exogenous variables I use

PLACE IN EXISTING LITERATURE

- Pennacchi and Rastad, 2010
  - Analyzed factors that effect risk in 125 public pension funds, as measured by tracking error
- Weller and Wegner, 2008:
  - Have public sector pension plan managers acted “imprudently” to chase returns after encountering underfunding?

CONTRIBUTION

- Looking at overall asset allocation (not a measure of risk or prudent behavior)
- Different exogenous variables
- More data years and more recent (as pensions have gotten more underfunded)
- Different models