Outline: Survey Weight Diagnostic Tests

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1 Introduction

1. One paragraph about survey weights in general that can summarize my first few pages of my literature review
2. Introduce Bollen *et al.* (2016) review of difference-in-coefficients and weight association diagnostic tests
3. Mention other survey weight tests like likelihood ratio tests.
4. Introduce Wang *et. al* (2023) simulation study and the limited scope of other simulation studies. Mention shortcomings of the studies and potential opportunities like a Bayesian survey weight diagnostic procedure and non-parametric methods.
5. Mention while research is often employs linear regressions, other models like generalized linear models have rarely been discussed with survey weight tests.

2 Survey Weight Tests

1. Include entire review of test from literature review. Make sure to focus on the distributional assumptions and compare how the tests might fail or outperform others.
2. Create Bayesian survey weight diagnostic procedure. **TO-DO**
3. Create non-parametric survey weight diagnostic test. This will likely be a permutation test of shuffling the weights across observation units such that if the weights are non-informative, then the difference between the actual β and permutated βs should not be statistically different from zero. **TO-DO**

3 Simulation Studies (See Methods document)

I am a bit conflicted on having a separate methods and results for the four different simulation studies for organization sake. I am thinking of having a methods and results combined in four different simulation studies sections.

1. Reproduce results from first simulation study from Wang *et al.* (2023) using generated data and weights.
2. Perform simulation study on Consumer Expenditure Survey data with all listed survey weight diagnostic tests using the following sampling methods:
   (a) Grouping
   (b) Probability Proportional to Size with noise
   (c) Stratifying (Use more than region)

(d) Simple Random Sample (as a Control)

3. Same simulation study as the CE dataset but now test using generalized linear models. Likely add another case of varying the model.

4. Lastly, do case studies to showcase new package functionality and test whether prominent articles should have considered using survey weights when they are available. Additionally, it will be nice to also replicate simulation study #2 on different datasets in case people have a personal vendetta against the CE dataset.

4 Discuss

1. Discuss the results from all four simulation studies. Make particular note on which case each test performed poorly and well.

2. Note future research directions.

3. Sell my glorious R package to the reader.