Homework 1

Submission 3, Spring 2026

Srijon Sarkar

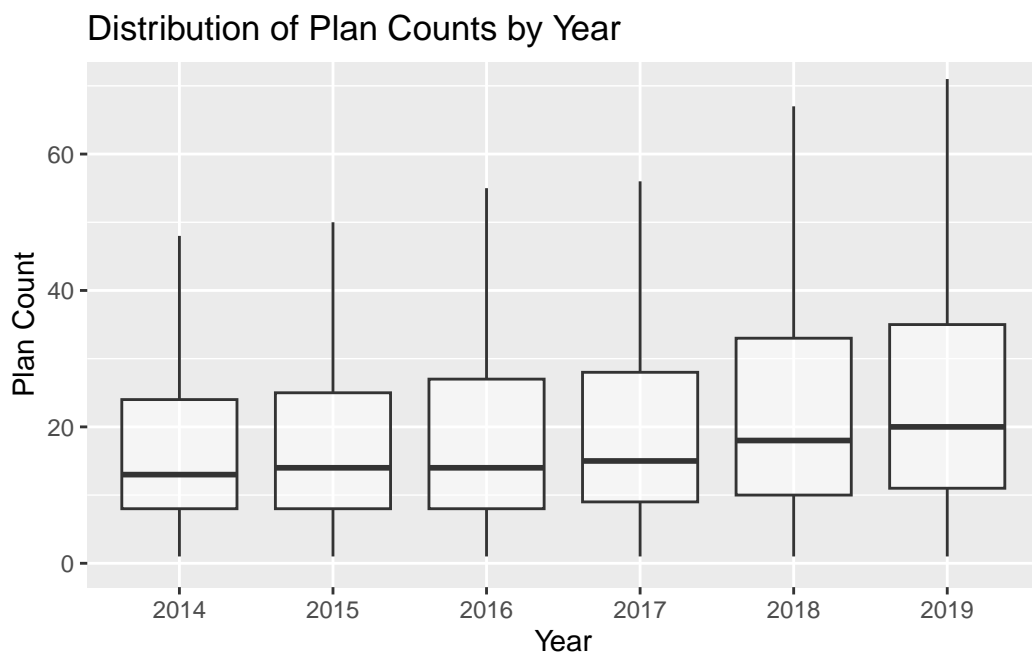**Problem 1**

Distribution of Plan Counts by Year

Figure 1: Number of Plans by County over Years

The number of plans would be sufficient, more skewed towards the side of being too many for potential enrollees to choose from, as we further see the number of plans per year to increase on average.
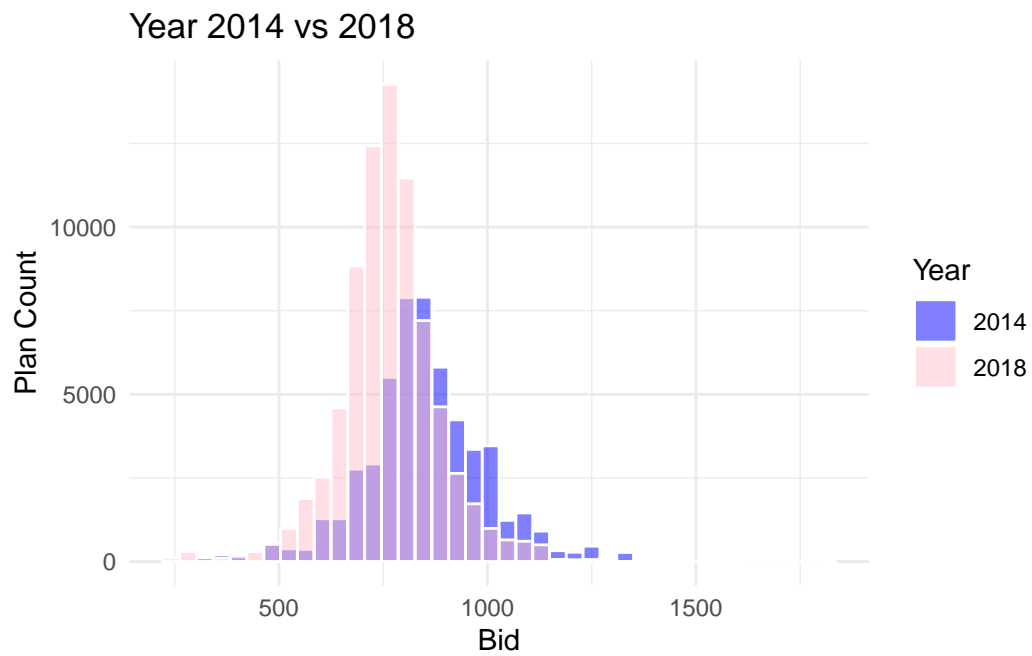
Problem 2

Figure 2: Comparison of bids between Year 2014 and Year 2018

Towards the tails we notice 2018 to have lesser plan bids as opposed to 2014 though minor. But, we see the plan count to have substanstially increased in 2018 compared to 2014.

Problem 3

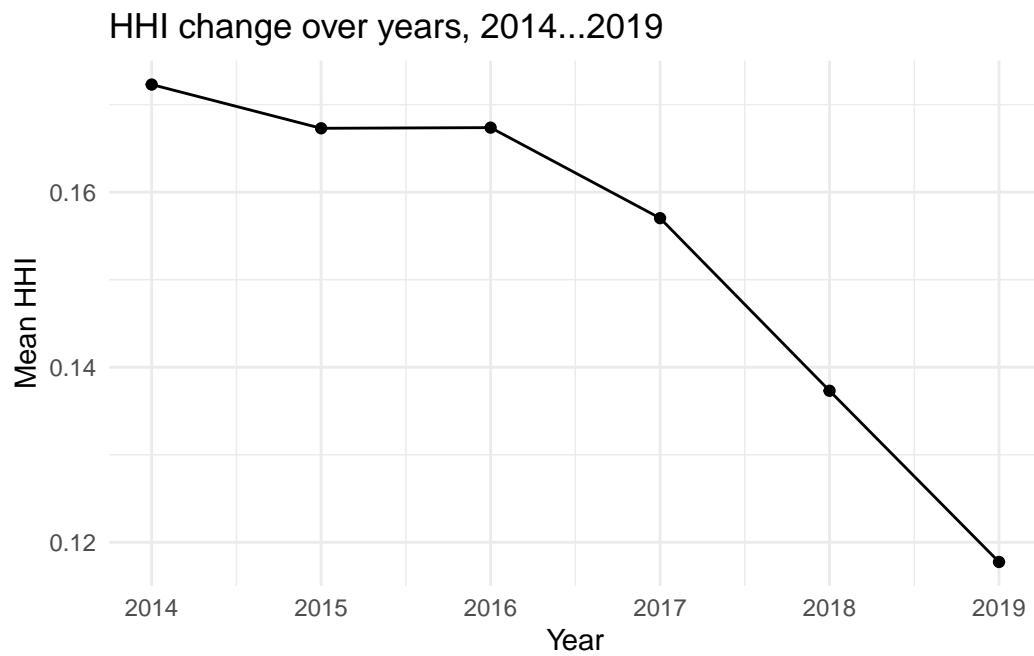## HHI change over years, 2014...2019

Figure 3: Mean HHI over Years

We notice the HHI (scaled between 0 and 1) has decreased over the years, indicating an increase in competitive markets. Particularly, the steep decrement from 2016 through 2019 is noticeable.

Problem 4
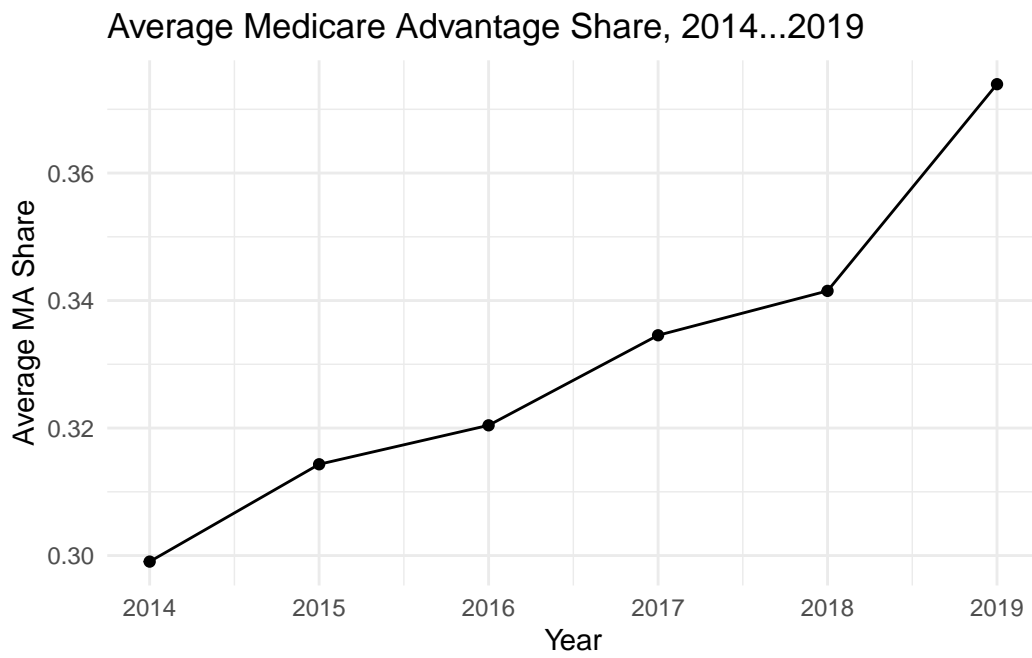
Average Medicare Advantage Share, 2014...2019

Figure 4: Aggregate MA share over Years

The mean Medicare Advantage share in the market (again scaled between 0 to 1) has increased over time from 2014 to 2019.

Estimate ATEs

Problem 5

Table 1: Average Bid Table for Year 2018

Market Type	Average Bid	Market Count
Competitive	782.86	961
Uncompetitive	788.32	915

Problem 6

Table 2: Average Bids as per FFS Quartiles and HHI

FFS Quartile	Low HHI	High HHI
1	788.81	814.56
2	784.27	780.50
3	775.19	765.66
4	783.97	784.83

Problem 7

Table 3: ATE through different estimators

ATE (Inverse Variance)	ATE (Mahalanobis Match)	ATE (IPW)	ATE (Regression Adj.)
3.2993	3.2993	3.2993	3.2993

Problem 8.

ATE calculated with all the method estimators, that is, nearest neighbor matching with inverse variance distance and Mahalanobis distance, and also Inverse propensity weighting and simple linear regression, are all the same, indicating the validity and robustness of the markers leading up to the calculation of the Average Treatment Effect and showcasing its invariance to calculation processes.

Problem 9.

We will use my favorite Mahalanobis distance on total Medicare beneficiaries alongside the FFS quartile.

Table 4: Comparing change in ATE upon additional covariate

Estimator	ATE Estimate
Mahalanobis Match	3.2993
Mahalanobis + Beneficiaries	4.9025

The absolute value of ATE has gone up when the total number of Medicare beneficiaries is included as a covariate when matching. It is still comparable to other ATEs obtained via nearest neighbor matching. It indicates that the inclusion of unbiased, nonconfounding covariates could aid in strongly hypothesizing about the null thesis when considering alternative questions about whether something brings an effect or not.

Problem 10

My experience was fulfilling working with these large data chunks; it really completed my prior experiences. One thing I learned is that my code runs much cleaner and is easier to navigate, as I built most of it from class notes, my concepts, and simple structural logic, rather than using LLMs that I genuinely use strictly for my personal use. One thing that surprised me was how strenuous data management could be when I had to change file names and column ranges while creating cumulative data files for each year, and generalizable RegEx expressions couldn't be deployed.