Homework 4-2

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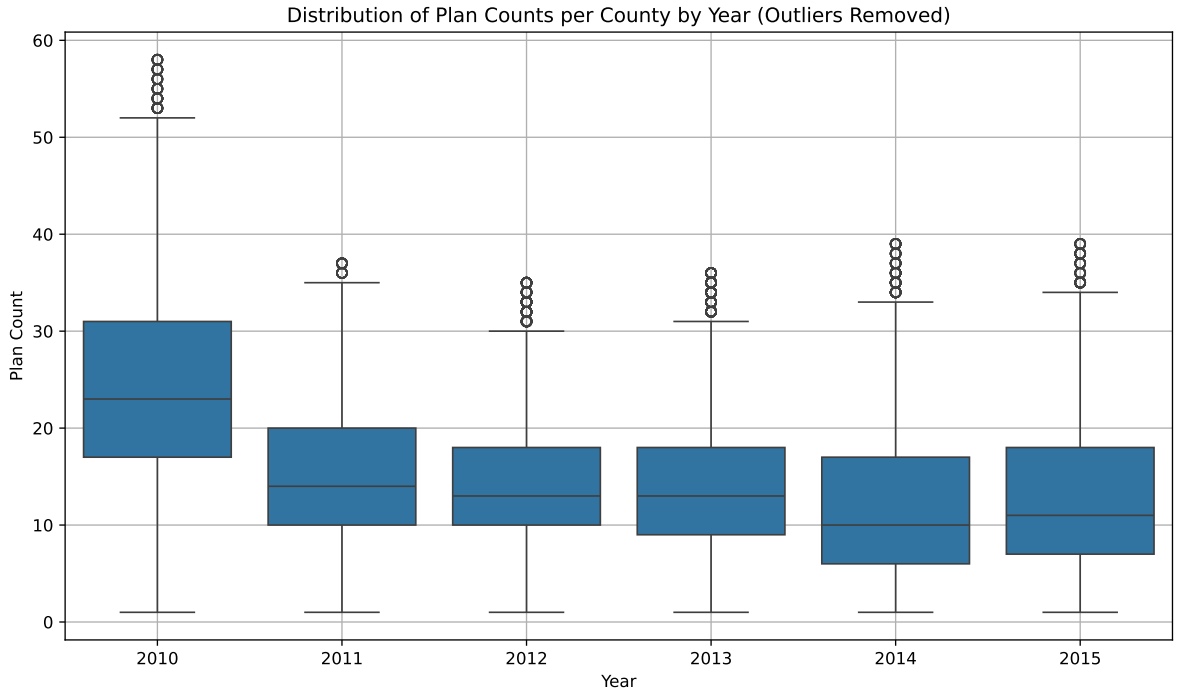
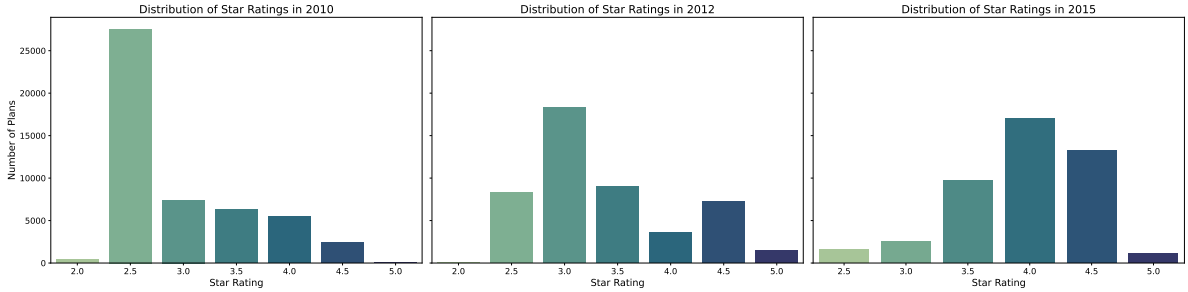
The link to my repository:
https://github.com/sarina-tan/HLTH470hw4/tree/main

1. Remove all SNPs, 800-series plans, and prescription drug only plans (i.e., plans that do not offer Part C benefits). Provide a box and whisker plot showing the distribution of plan counts by county over time. Do you think that the number of plans is sufficient, too few, or too many?



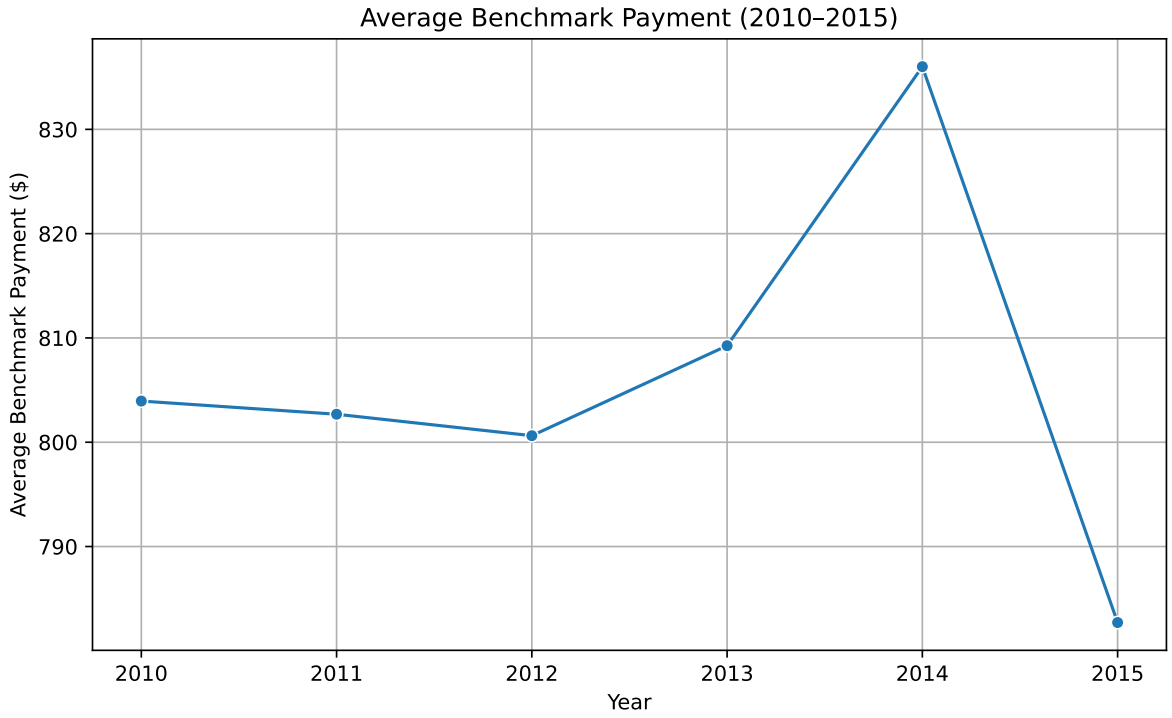
Interpretation: Overall, I think that the number of plans is sufficient but the wide variation and outliers may imply both too few and too many.

2. Provide bar graphs showing the distribution of star ratings in 2010, 2012, and 2015. How has this distribution changed over time?



Interpretation: Over time, star ratings trended rightward over time, likely due to actual enhancements in plan quality, adjustments in CMS evaluation methods, or a combination of the two. By 2015, the market was largely composed of higher-rated plans, a shift that could significantly impact consumer decisions and the financial incentives linked to star ratings.

3. Plot the average benchmark payment over time from 2010 through 2015. How much has the average benchmark payment risen over the years?



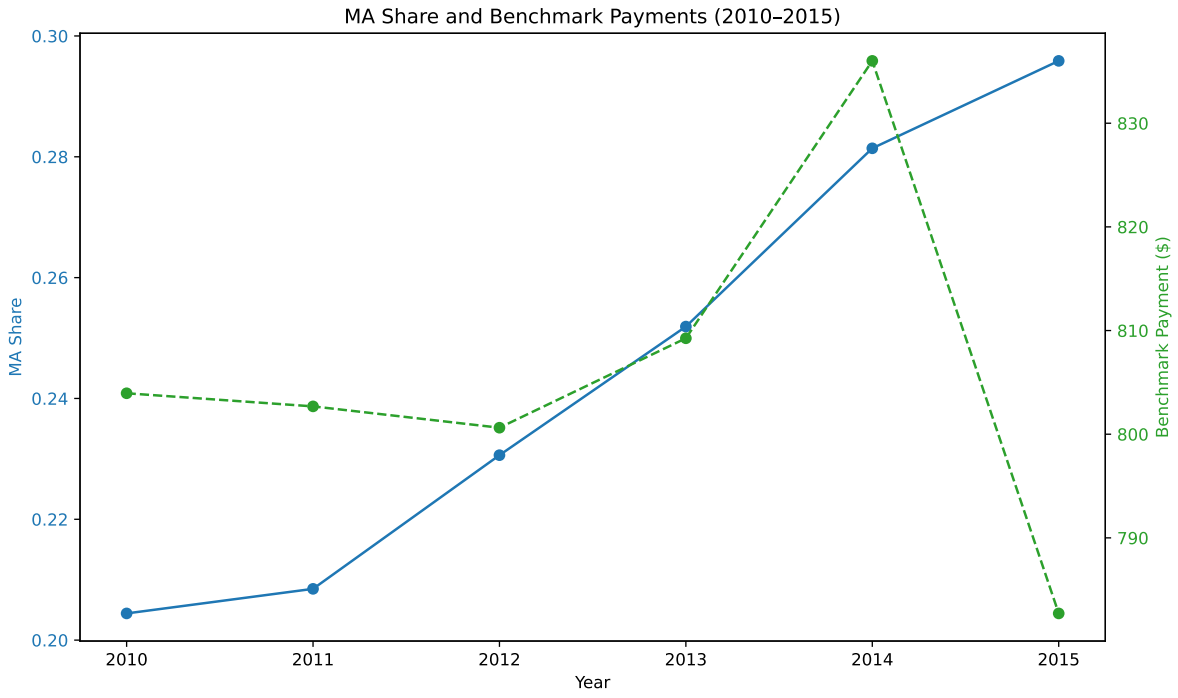
Average Benchmark Payment by Year:

	year	ma_rate
0	2010	803.948611
1	2011	802.684419
2	2012	800.626973
3	2013	809.254803
4	2014	836.013611
5	2015	782.711741

Increase from 2010 to 2015: $-21.24

Interpretation: From 2010 to 2014, average benchmark payments for Medicare Advantage plans rose steadily, peaking at $836.00. However, in 2015, the benchmark dropped sharply to $782.71. Despite earlier increases, the overall change from 2010 to 2015 was a net decrease of $21.23, possibly due to policy changes or cost-containment measures.

4. Plot the average share of Medicare Advantage (relative to all Medicare eligibles) over time from 2010 through 2015. Has Medicare Advantage increased or decreased in popularity? How does this share correlate with benchmark payments?

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Correlation between MA share and benchmark payment: 0.065
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Interpretation: The correlation between average benchmark payments and market shares is just 0.065, so it doesn't seem to be strongly related to Medicare Advantage benchmark payments.

5. Calculate the running variable underlying the star rating. Provide a table showing the number of plans that are rounded up into a 3-star, 3.5-star, 4-star, 4.5-star, and 5-star rating.

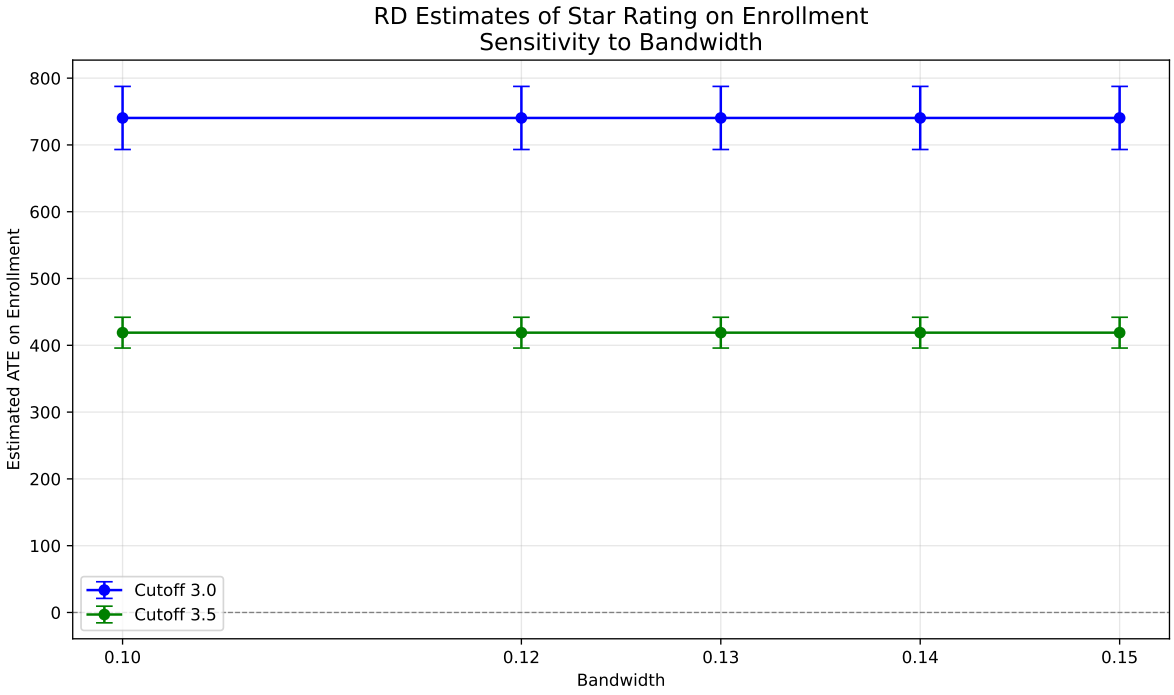
`Number of Plans by Rounded Star Rating (2010):`

	Rounded Star Rating	Number of Plans
0	2.0	431
1	2.5	27549
2	3.0	7419
3	3.5	6347
4	4.0	5453
5	4.5	2459
6	5.0	75

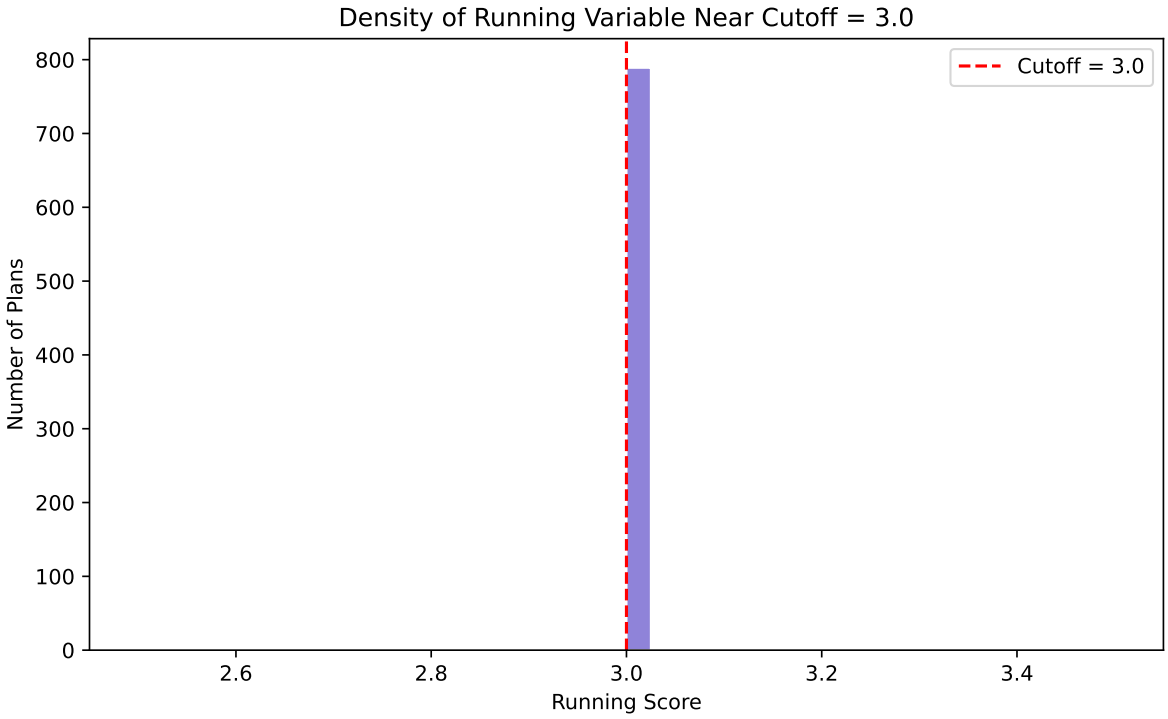
6. Using the RD estimator with a bandwidth of 0.125, provide an estimate of the effect of receiving a 3-star versus a 2.5 star rating on enrollments. Repeat the exercise to estimate the effects at 3.5 stars, and summarize your results in a table.

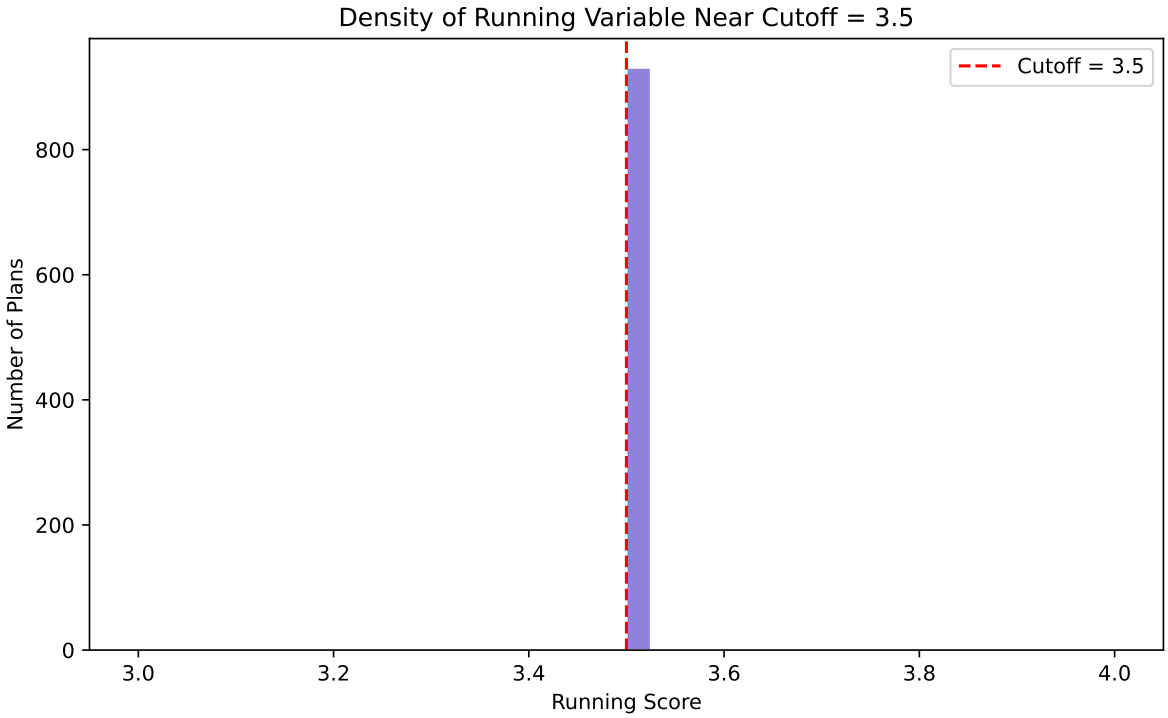
	Cutoff	Bandwidth	Estimated ATE	Standard Error	N
0	3.0	0.125	740.394199	47.231624	3034
1	3.5	0.125	418.940257	23.056193	2879

7. Repeat your results for bandwidhts of 0.1, 0.12, 0.13, 0.14, and 0.15 (again for 3 and 3.5 stars). Show all of the results in a graph. How sensitive are your findings to the choice of bandwidth?



8. Examine (graphically) whether contracts appear to manipulate the running variable. In other words, look at the distribution of the running variable before and after the relevent threshold values. What do you find?





Interpretation: To evaluate potential manipulation of star ratings around key thresholds (3.0 and 3.5), the distribution of the raw running variable was analyzed within ±0.3 of each cutoff. The resulting histograms show smooth, continuous distributions with no sharp increases or clustering just above the thresholds. These patterns suggest no clear evidence of manipulation, indicating that plans do not appear to be strategically adjusting ratings to cross these benchmarks.

9. Similar to question 4, examine whether plans just above the threshold values have different characteristics than contracts just below the threshold values. Use HMO and Part D status as your plan characteristics.

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Covariate Balance Around RD Thresholds (Bandwidth = 0.125)
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	Group	Share HMO	Share Part D	Number of Plans
0	Above 3.0	0.0	0.893651	7419
1	Above 3.5	0.0	0.853317	6347

10. Summarize your findings from 5-9. What is the effect of increasing a star rating on enrollments? Briefly explain your results.

	Cutoff	Rounded Star Rating Plan Count	Estimated ATE	Standard Error	N (Sample Size)	Share H
0	3.0	7419	740.394199	47.231624	3034	0.0
1	3.5	6347	418.940257	23.056193	2879	0.0

Interpretation: Summary of Findings from Questions 5–9

The analysis shows that increases in star ratings have a significant positive impact on plan enrollment. At the 3.0-star cutoff, crossing the threshold results in about 740 additional enrollees (SE 47), while at the 3.5-star cutoff, the increase is around 419 enrollees (SE 23). These estimates come from a regression discontinuity design (RDD), leveraging the near-random assignment of plans around each threshold.