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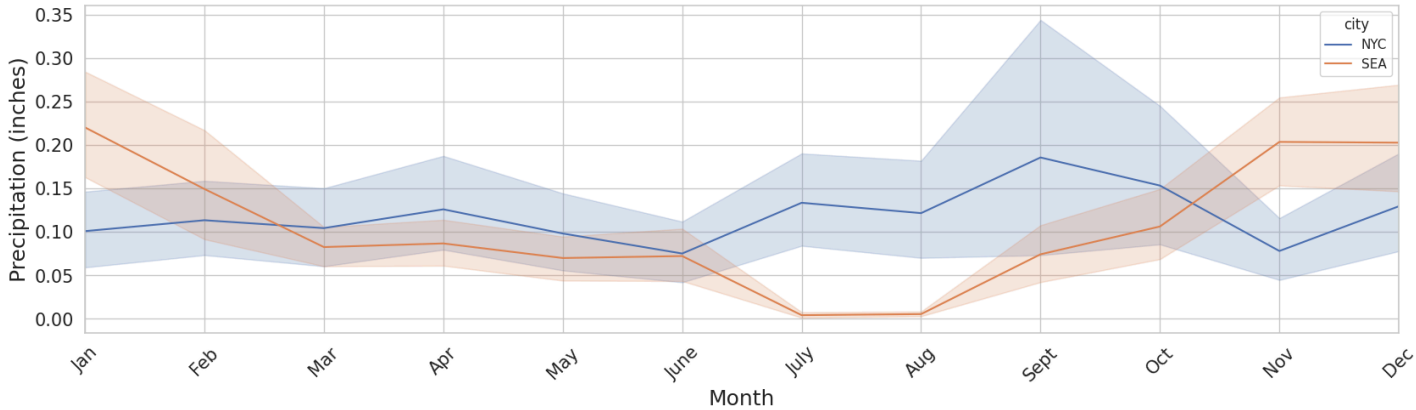
DATA 3320 01 - Communicate the Results

We wanted to answer the question, “in which city does it rain more, Seattle or New York?” for Professor Egan’s family to decide whether or not to visit Seattle more often. Initially, I would have thought Seattle rained more because the city is known for being gloomy, overcast, and rainy for most of the year. However, through some simple data analysis techniques, I believe I found a good yes-or-no answer to the question even though there are more layers than anticipated.

First, I want to preface this report by conceding that each person will have a different definition of “more”. For example, some people may not consider a drizzle to be rain at all even though there is technically rainfall. Therefore, I’ve centered my answer around two metrics that I think most people can get behind: frequency and magnitude. Frequency being the, how often it rains, and magnitude being the, how much does it rain, questions.

To get a basic measure of rainfall, I found the average and standard deviation of rainfall for each city. The average rainfall measures for New York and Seattle were 0.118207 and 0.105921 inches respectively. With just these measures, it would be perfectly logical to say that it rains more in New York; but, we have to give more context to these measures. As for the standard deviation, I computed 0.359260 inches for New York and 0.237903 inches for Seattle. With a greater standard deviation, we can assume that in a given month, we can expect less predictability of rainfall in New York when compared to Seattle. New York’s rainfall is more volatile and therefore less easy to predict. This doesn’t necessarily mean it will rain “more” in New York, but it is good to contextualize our average rainfalls through how much we can trust the averages.

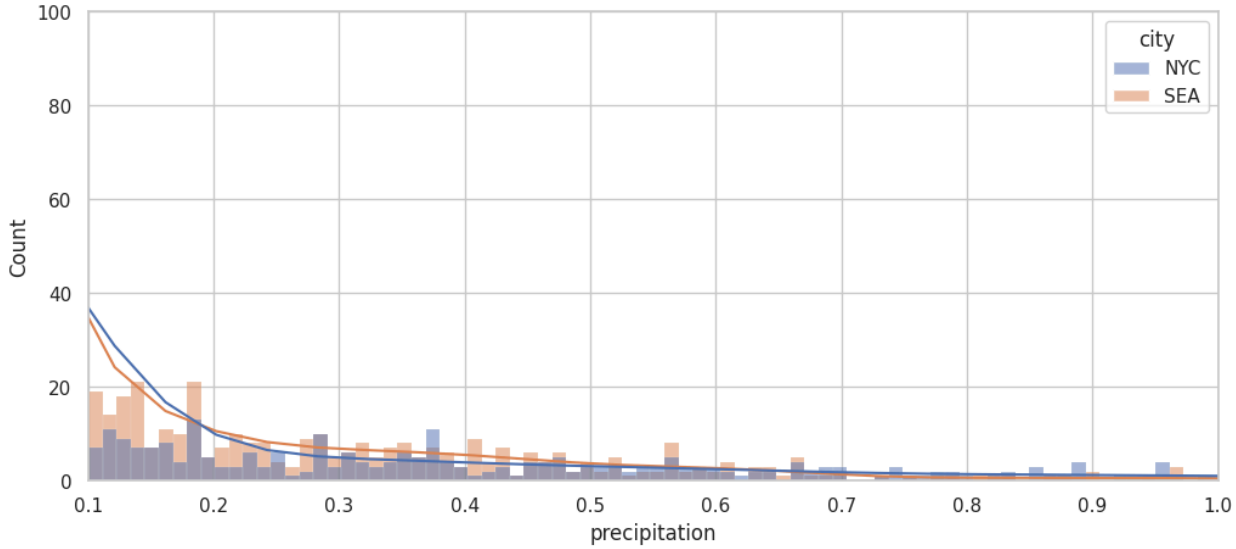
Next, I visualized the average rainfall in each city for the whole time period (2020-2024) with a 95% confidence interval. Meaning, we can be 95% sure that the true precipitation values for each month are within the highlighted ranges. Using confidence intervals is not a perfect



science, but it helps to incorporate standard deviations and averages together on a plot. Here we can see a lot of variability or volatility in New York’s rainfall, especially during the months of

August and October. As for its ability to answer the original question, does it rain more in Seattle or New York, we can be sure, almost without a doubt, that Seattle rains less than New York from mid-June through mid-August. As a matter of fact, the plot shows that we can be almost positive that it won't rain at all or very little during the same time period.

As for the question of frequency, I decided to use a histogram that shows the frequency of occurrence of rainfall greater than 0.1 inches with a kernel-density estimate (KDE) to show a general flow/eb to our data.



From a quick glance it may be difficult to tell in which city it rains more frequently, especially when we start moving to the right into more intense rainfall. The KDE helps to give us a more definitive answer. We can see that the New York (blue) line lies higher than the Seattle (orange) one at lower magnitude rain levels. Then, at around 0.2 inches, they intersect and Seattle ends up on top of New York's line. Based on what the variables are, my interpretation was that New York experiences higher frequencies of low magnitude rainfall while Seattle experiences the opposite, higher frequencies of high magnitude rainfall. High magnitude rainfall in both cities are still rare compared to low magnitude rainfall, but it's good to know that torrential rains are more common in Seattle. A historical advantage of having less high magnitude rainfall may be enough to convince some that Seattle rains "more" than New York; however, the true answer will always be more nuanced. This plot doesn't take time/date into account. If Professor Egan's family were to choose a random time out of the year to visit Seattle, they may find that Seattle will rain more intensely when it does rain. However, if choosing deliberately, Professor Egan's family will find success in avoiding Seattle's deluge during the summer months.

In conclusion, I believe that with careful planning and these analyses in mind, Professor Egan's family should feel confident in visiting Seattle. Seattle does on average rain less; however, when it does rain, Seattle rains can be torrential. Furthermore, we can feel more confident in Seattle's average rainfall readings through our consideration of standard deviation. In all, I consider Seattle to be the "less" rainy city.