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Mont 107N-01 Understanding Randomness

Professor Little

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How likely are streaks?

The study of statistics over the past 50 years has led to a dramatic change in the way humans view the world. The work done by many statisticians and scientists has produced scientific results which suggest that life is based simply on probability. One topic in particular that has gained considerable attention in the sports world is the record set by Joe DiMaggio and the impact probability had on his historic streak. His record 56 game hitting streak is the one record that many analysts and true fans of the game say will never be broken. Scientists however have developed models that contradict the opinions of the games’ greatest. This contradiction has created tension within the athletic community and also the scientific community due to the variability that exists within sports and the number of confounders which could alter a predicted data set’s results. The issue of streaks in sports was most notably addressed by Leonard Mlodinow in his article entitled “The Triumph of the Random from banking to baseball, winning streaks owe much to the laws of chance”. The article presents a view point that chance can explain the occurrence of the streak and that it was due to happen but by examining the variability of baseball it can be surmised that although somewhat due to probability and chance the record and other lengthy streaks set by players is due mostly to their skill rather than a chance occurrence.

Leonard Mlodinow the author of “The Drunkard’s Walk” goes into great detail when analyzing the effects that streaks have in modern day life. To begin the analysis Mlodinow addresses the fact that in order to accurately predict the outcome parallels must be drawn. In his analysis he compares the chance of DiMaggio getting a hit to a weighted coin such that a favorable outcome occurs 75% of the time and in DiMaggio’s case a game. He then goes on to explain how thousands of player’s over the history of baseball try to achieve a similar streak. Given the two facts he proposes that the streak of DiMaggio was due to occur regardless of the person but just because statistically you would expect and outlier to occur that would yield similar results. The next analogy he makes is with another sport basketball and addresses the discrepancy that exists when people are comparing foul shots to coin flips. In his analogy, he is assuming that the coin and the shooter both have an 80% likelihood of having the desired outcome. In the analogy he says that people flipping the weighted coin wouldn’t be surprised if heads came up 10 times but if an 80% free throw shooter made 10 free throws in a row it would be due to luck. This analogy was meant to draw criticism to people over-assuming the belief that chance solely affects results and also reflects the necessity for a large number of trials to ensure accurate results. The necessity for large number of trials is best illustrated in the World Series example given by Mlodinow. He first describes how in a seven game World Series, although counterintuitive, the lesser talented team will win 40% of the time. Even if there is a 45% percent chance that the lesser team will win each game the small number of games only drops that chance down to 40%. This outcome can be explained because the number of games is so small that the chances for the lesser team will win is higher and defies the common sense logic. When calculated (below) though the results are the same and support those found by Mlodinow. He further goes on to say though that in order to ensure the best team wins at least 95% of the time the World Series must last 269 games.

The following calculations are done using a binomial equation. After the sum of the percentages is taken for each possible outcome, the percentages are then added and divided to find the likelihood of one event occurring compared to the other

Lesser team winning Better team winning Sum of percentages

(4 4)(.45)4 = 4.1% (4 4)(.55)4 = 9.2% Lesser = 57.8 %

(4 5)(.45)4(.55)1 = 11.2% (4 5)(.55)4(.45)1 = 20.6% Better = 86.8%

(4 6)(.45)4(.55)2 = 18.6% (4 6)(.55)4(.45)2 = 27.8% Percentage comparatively for lesser

(4 7)(.45)4(.55)3 = 23.9% (4 7)(.55)4(.45)3 = 29.2% 57.8%/144.6% = 40%

The final few paragraphs of Mlodinow discuss in greater detail the exact science behind his assertion that the streak completed by DiMaggio was nothing more than a chance occurrence. His main evidence lies in the work done by a pair of scientists at Cornell University who developed a computer system model that analyzed the entire history of the game and created a parallel universe where all seasons of the game occurred. This parallel universe was then recreated 10,000 to ensure accurate results. The conclusions found that in 42% of the universes a player had a streak equal to or longer than that held by Joe DiMaggio. In those universes the streak was held by many other players, with the greatest number of streaks held going to players other than DiMaggio. The final paragraphs also address the possible confounders that would go into establishing a computer program that would accurately predict a model like done by the Cornell scientists. These confounders would drastically alter the results but however must be ignored in the interest of the model obtaining results. This means that assumptions would have to be made and could mean that the results aren’t accurate.

The final paragraph provides a more personal opinion to everything and contradicts many of the points raised by Mlodinow. His closing sentence provides no definite answer as to whether or not the streak is based on chance but rather that it is a factor that should be contributed to when discussing extraordinary events like the one that DiMaggio thinks.

The final point raised by Mlodinow is the point accurately describes my opinion as to whether or not a streak like DiMaggio’s is based on skill or chance. I believe that it takes skill to accomplish what he did but also luck and chance. There are too many confounders that could go wrong like, for example him getting hurt that could ruin a streak or a game being called short due to weather before he receives a suitable amount of at-bats. This is where luck and chance play some role because they are factors that are out of DiMaggio’s control that would end his streak. For example the final game of his streak when he went hitless, DiMaggio had two hard hit balls that required amazing plays to get him out. This is an example of a variable that can’t be accurately predicted by a statistical model. There are too many indefinites that would alter the data. Other confounders include, the weather, the ball moisture content from day to day, the altitude that he played in, the slight gust of wind that carried his ball over the fence. These confounders are unpredictable that is why it isn’t safe to trust the program designed by the Cornell scientists. They made assumptions and sacrificed key elements which could drastically alter the overall results.

They also failed to realize that the sample they used wasn’t representative of the population of people, it was based solely on the population of the baseball world. By their conclusions you can surmise that the trend they discovered would continue in the future; but that is assuming that the future baseball players have already been decided and also their stats. In order to truly have accurate results they should have made a representative sample of the entire population. The results could show from that sample that Joe’s record is astronomically unlikely. By having the sample only include baseball players the scientists only included talented people but if the record was solely due to chance then talent level should have no impact, it should only be due to the luck of the draw. This is why I believe that skill plays a large role in success of Joe DiMaggio, because he had the talent to do the streak but required a small bit of luck . If skill played no role in it than any average fan would have stood as an equal of a chance as DiMaggio would of achieving such a streak and that isn’t true.

I also believe that is impossible to accurately predict how someone will do game for game. Seasonal averages do reveal an overall trend but even Mlodinow own example of the World Series proves that it’s inaccurate to predict wins and losses because of variability. In addition to Joe’s streak a pitcher could be going through a hot streak in which he goes 5-0 and doesn’t allow a single run and threw 5 no hitters but performed poorly the rest of the season and ended up with an abysmal record and high era as a season average. In the Cornell model there may not have been a way to account for such streaks. In that model Joe faced that pitcher on his hot streak and didn’t get a hit, and his streak would end. The variability that exists can only be eliminated by looking at each pitch as an individual event calculating it based on that individual event and that is too difficult to accomplish given the circumstances. The necessity for exact probability calculations is something that can’t be accounted for and therefore makes me reluctant to believe the Cornell model.

Statistics can’t predict human elements like throwing a pitch harder or diving an inch more to grab a ground ball and therefore a model for predicting how likely a streak is to be broken can’t be trusted. Although that one play may not matter in the long run, that one play could end a streak and would impact history. Although helpful the Cornell model should only be used as a guide of what could happen not what will happen. This is an example of humans mis-estimating the likelihood of streaks because they are trying too hard to find a pattern in something that can’t be quantified. Although it might be in human nature to try to find patterns in the world around us by trying too hard we expose ourselves to making mistakes and making assumptions that will lead to inaccurate conclusions. This is what could have happened in the Cornell model, they tried to find a pattern that led them to make the claim that DiMaggio’s record was due to chance. I however believe that skill was the major factor that allowed him to achieve his record not chance. I do think the record will be broken eventually just because the level of skill in the game has increased dramatically and eventually someone will achieve a similar record, but it will be due mostly to skill not chance.