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Question 1.1 – Non-Technical Answer

Who are the best (and worst) shooters?

How confident are you in your answers?

Answer:

Defining Shooting Talent

If we want to isolate shooting talent, we need to properly account for shot quality. For example, some shooters may manage a high shooting percentage by virtue of creating dangerous opportunities, while others score frequently despite attaining a large share of their looks from afar or from traditionally non-threatening locations on the ice. The latter case would qualify as a talented shooter, whereas the former is creating goals via an entirely different skillset.

Accounting for Shot Danger with Expected Goals

A convenient tool for tackling this problem is a metric called Expected Goals, which estimates a goal probability for each shot at the point of release. In this case, our Expected Goal model accounts for factors like shot distance, angle, shot type, man-power situation, rush situation and rebounds. If we add up the Expected Goal values of a skater's opportunities, we can quantify how many goals they should have scored given the quality and quantity of their opportunities. Comparing this total to their actual goal total can help us identify exceptionally good (or poor) shooters.

The Sample Size Dilemma

Sometimes comparing shooters can be difficult for two reasons...

- 1) We don't really know how many shots a shooter must take—or expected goals they must accrue—before we can trust their results
- 2) It's difficult to compare shooters of different sample sizes

For example, which player is the better shooter?

Player A: 10 Expected Goals, 17 Goals

Player B: 34 Expected Goals, 45 Goals

It is tough to say without involving some statistics.

Extraordinary Claims Require Extraordinary Evidence

One solution to this problem is to introduce a prior distribution. In other words, we need to define our starting assumptions regarding the shooting talent of an unknown NHL player. For example, there may be a feasible range of shooting ability observed at the NHL level. Think back to Player A – maybe 17 goals scored on 10 expected goals is a rate of over-performance that is almost never seen in the NHL after a shooter takes a large number of shots. In that case, if we were to estimate his true shooting ability, we would be highly skeptical of his current pace. Another common assumption is that most NHL players are near league-average, with a much smaller number of elite shooters and spectacularly poor shooters in comparison. That may also cause us to dampen our opinion of a player until they sustain a high-level of play for a long period of time, simply because average players are far more common.

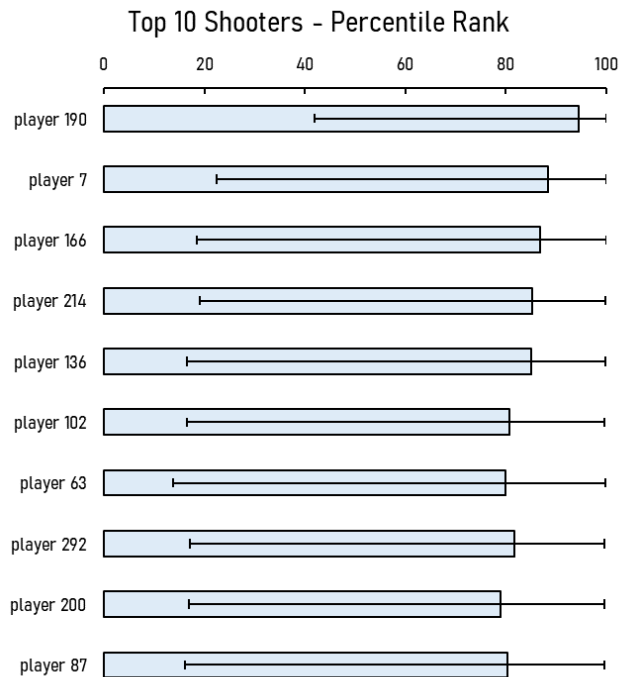
These prior assumptions regarding NHL shooters can be captured in a mixed effects model. The goal of this particular model is to predict how a skater influences the probability of a goal after accounting for shot quality (i.e., Expected Goals), with the starting assumption that they likely possess near-average shooting ability. If evidence builds contradicting this starting assumption, skater estimates will slowly move away from league average.

Shooting Talent and Uncertainty

Not only can we retrieve shooting talent estimates from our mixed model, but we can also quantify uncertainty. One way to do this is to compute a feasible range within which a skater's shooting talent may fall given the evidence. One way to represent this range is by using percentiles. For example, we could say something like...

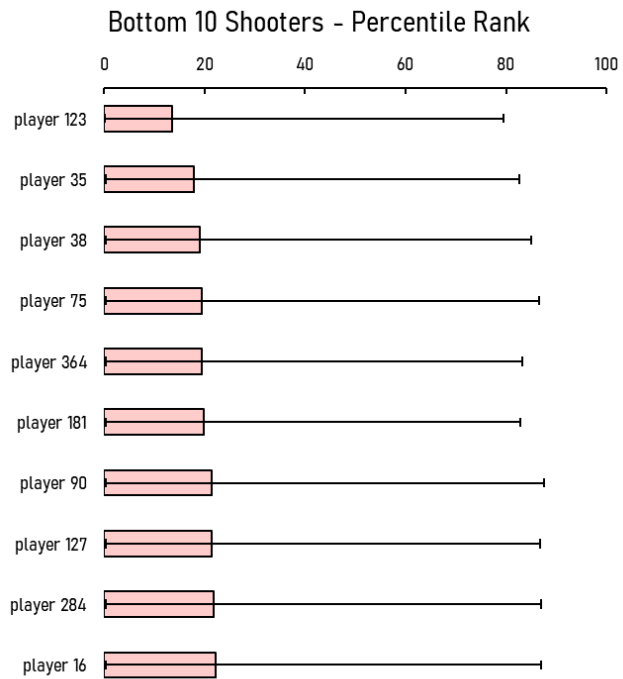
"In all likelihood, Laine is better than 85%-to-100% of NHLers at shooting the puck"

In fact, we can produce ranges like this for any given NHL player. Here are the top 10 rated shooters, their median percentiles and an error bar indicating a feasible range within which their true talent lies...



Notice that player 190, our highest rated shooter, has a median percentile of about 95. That means that his middling scenario is that he's better than 95% of NHL shooters. That sounds great but precision is important. His low end stretches into the low 40s – so he could feasibly be a ~40th percentile shooter given the evidence as it stands!

Our bottom 10 shooters show even wider intervals...



What we can say for certain is that great and terrible shooters do exist, but we must be cognizant of the fact that identifying them is uncertain.