Analyzing Goalie Returns using a Sharpe Ratio

Among the players on a hockey team, the goalie is arguably the most important player on the team. However, there are a very limited number of ways to analyze them and determine their true worth to the team other than their save percentage, their most important stat line. This project introduces a new way to estimate the worth of a single year in a goalie’s career: a modified Sharpe Ratio. In economics, a Sharpe Ratio is a measure of how well an asset is doing by comparing it to other assets of a similar risk level and finding a market standard.

The Data

The Sharpe Ratio can be found by the following formula: where is the Sharpe Ratio, is the asset’s return, is the average rate of return for assets of similar risk, and σ is the standard deviation of the returns of similar risk assets.

In the case of the NHL, or more specifically goalies, this can be a good way to judge how well a goalie is doing by considering the other goalies of the NHL. The modification to the Sharpe Ratio looks like: where is the goalie’s save percentage, is the league average save percentage, and is the standard deviation of save percentages\*. When the standard deviation is computed later, it is found using only goalies with at least 250 minutes of time on the ice.

This ratio gives us some nice properties: firstly, a goalie has a modified Sharpe Ratio (MSR from now on) if and only if he is performing at the league average. Secondly, a positive MSR means that the specified goalie is doing *better* than average, and a negative MSR means that said goalie is doing *worse* than average. That said, it can be hard to tell exactly how much above or below average a goalie is performing given only his MSR.

The Big Question

How well does MSR correlate to salary? Well, when we graph it, we get this:

A graph with black dots

Description automatically generated

At first sight, there doesn’t seem to be any patterns. But this is not the case. Firstly, we can see that there is a rough normal distribution of goalies’ MSRs while the goalies are getting paid less than 2.5 million dollars, illustrated below by the blue box:

A graph with a line and a line

Description automatically generated

Then, from the goalies not in the box, another minor pattern emerges: if the goalie is getting paid over 3 million dollars, the salary does tend to go up with MSR. We can see that with this graph:

A graph with a line and dots

Description automatically generated

The Big Winners (and Losers)

To begin, it is important to note that logically, and statistically, a higher MSR will likely lead to a more winning season. In the graph below, there is a clear correlation between a goalie’s MSR and his win percentage.

A graph with a green line and black dots

Description automatically generated

So, what does a team want in a goalie? They want him to have a high save percentage, which means a higher MSR, and if a team can get away without paying too much, that is an equally large win considering the hard salary cap in the NHL. In the graph below, there are three boxes:

* The red box is a no-go. These are the below average goalies. The further left you go, the closer you get to the bottom of the barrel.
* The yellow box is full of goalies to consider, but their salaries are reflected too. These goalies are the ones to take if a team is trying to fill cap space (why?), or maybe a few big-name goalies that want a lot of money to play.
* The green box is your bargain bin. Your above average goalies at a fraction of the price of the goalies in the yellow box. This box is what every team tries to get their hands on. The further right you get is closer to the top-notch goalies.

A graph with different colored lines

Description automatically generated with medium confidence

Obviously, the red box has the lower half of goalies in the league. However, most of their salaries are low too, so a team might want to consider the ones on the right of the red box if they can’t get a goalie in the green box and don’t want to pay a fortune.

Now, who are these goalies? What teams did they play for? How well did their teams turn out in that 2011-12 season?

Here are the top 5 goalies by Sharpe Ratio (or equivalently, the top 5 goalies by save percentage): A graph with a red line and black dots

Description automatically generated

Leading is Brian Elliott, with a .747 MSR. His team (the St. Louis Blues) made it to the playoffs that year, and lost in the second round. Next is Cory Schneider, with a .663 MSR. The Vancouver Canucks made it to the playoffs with him and lost in the first round. Tied for third, are Henrik Lundqvist and Mike Smith, each with a .465 MSR. Lundqvist played for the Rangers, who lost in the conference championship, and Smith played for the Coyotes, and his team also lost in the conference championship (though on the other side). Tied for fifth are Jonathan Quick and Tuuka Rask, each with a .437 MSR. With the Bruins, Rask lost first round in the playoffs, and Quick won the Stanley Cup with the Kings. It isn’t hard to see that a high MSR can lead a team to the playoffs.

If we decide to look at salary, then the top 5 are, in order, Robert Luongo, Henrik Lundqvist, Jean-Sebastien Giguere, Miikka Kiprusoff (tied third), and Tomas Vokoun. Luongo played for the Canucks, who again, lost in the first round. Giguere played for the Avalanche (did not make playoffs), Kiprusoff played for the Flames (did not make playoffs), and Vokoun played for the Capitals (made playoffs, lost in second round). Salary, at most has very little to do with how well a team does, and with better and cheaper options, most of these teams had good seasons, but simply not good enough.

A graph with black dots and white text

Description automatically generated

If you’re wondering who the bottom five are, here they are. Only one of them had more than 1000 minutes of time on the ice, so there were other goalies on these teams that played far more often than these guys.

A graph with black dots and white lines

Description automatically generated

Additional Work Ideas:

Given more time, here are some follow up ideas I have for this project:

* Look around for other ratios like the Sharpe Ratio and play around with how well it correlates to winning, salary, and other factors.
* Look into Graph Theory and see if a goalie’s passing network and it’s connectedness can be correlated to MSR, winningness, or salary.
* See how an expected save percentage correlates with actual save percentage, MSR, winningness, or salary.
* Try to find a correlation between certain players on the ice and statistically different save percentages. This could tie into the graph theory approach as well.

Sources and Credits:

NHL Player Data:

https://www.nhl.com/stats/

NHL Player Salary Data:

https://www.capfriendly.com