Stripping Away Natural Aging to Assess Contract Year Performance

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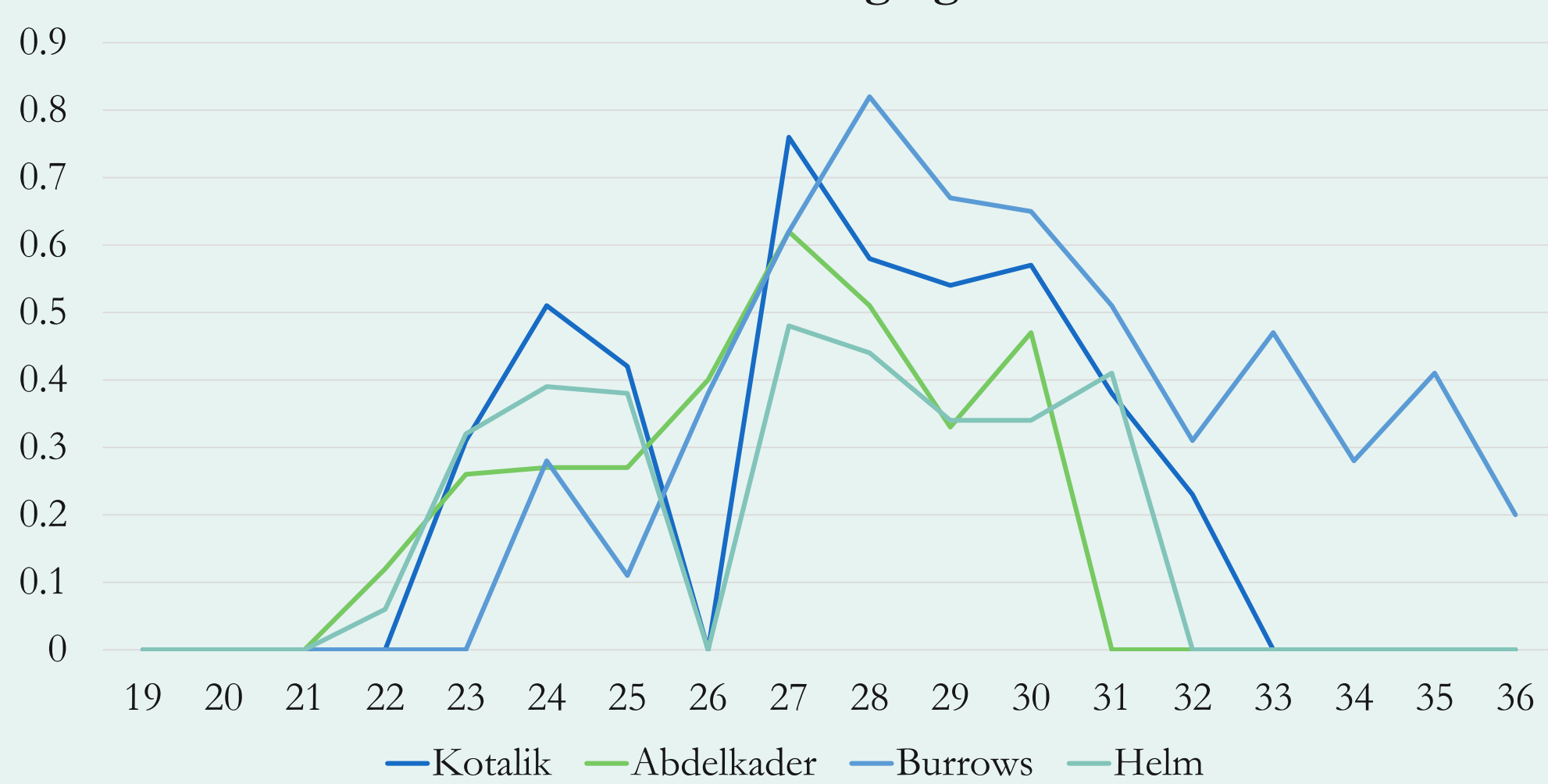
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Research Objective

The question this research sought to answer was whether players do improve leading into a new contract and if so is it because of them putting forth more effort or is the improvement due to natural aging. Furthermore, it is a common perception that players lose some motivation once they sign a new contract. The study also looked if players decline more than would naturally be expected of them after they sign a new contract.

Introduction

One of the toughest decisions National Hockey League (NHL) teams must make is how much to pay a player when the time comes to sign any given player to a new contract. Many NHL observers expect a player to play significantly better in a season (or seasons) leading up to a contract negotiation. Studies outside of sports have suggested this is the case of employees when they are potentially up for a raise. However, athletes are of course unique in their career trajectories.

It is widely accepted that athletes follow a well-defined aging curve throughout their career. The aging curve they follow shows they should naturally progress from the start of their career till around age 26-28. The relatively standardized contract lengths ensure most players will sign at least one contract while they are still naturally improving and most players who become free agents, while still in their prime, will do so around age 27. After the peak between age 26-28, players are expected to naturally decline at a similar rate to how they improve in their earlier years in the league.

Points Per Game Aging Curves

Methods

Advanced statistics were collected for all players to play at least 200 minutes in a season from 2012 to 2018. Statistics that were used in this study were time on ice, Corsi For %, Rel Corsi For %, Goals/60, Total Assists/60, Primary Assists/60, Blocked Shots/60, and Hits/60. These statistics were chosen logically as we believed they are indicative of what teams look at when deciding how much to pay a player.

Players were then divided into tiers. For each tier, a second-degree polynomial was fitted to determine a generalized aging function for each tier. The function was then solved to determine the expected performance level at each age for each statistic. A percent increase (decrease) was then calculated for each age and compared to the performance of the players in the sample.

Finding the tiers:
• Divided players by position (Forward & Defense)
• Added height and weight to determine a "body mass score" for each player
• Found positional average and standard deviation
• Divided players into six tiers based on how many standard deviations they fell from the mean

Criteria to be a player in the sample:
• Contracts signed from Jan 1st, 2014 to June 30th, 2018
• Average Annual Value of at least $1,500,000
• Both UFAs and RFAs included
• 415 contracts in total

References

• Statistics courtesy of naturalstattrick.com
• Contract data courtesy of capfriendly.com

Results

Below is a chart showing the number of players to perform better leading into a new contract. The chart also identifies the number of players to improve more than 5% when stripping away the expected progression (or regression) from aging.

	TOI	CF%	CF% Rel	Goals/60	Total Assists/60	First Assists/60	Hits/60	Shots Blocked /60
Players to Progress	297	187	123	192	194	193	195	207
Players > 5% better	250	107	119	192	186	181	159	173
Difference:	47	80	4	0	8	12	36	34

Outside of TOI, less than 50% of players actually improved leading into a new contract, contrary to popular belief. In statistics that could be influenced by effort (TOI, CF%, Hits/60, Shots Blocked/60) are where there are the most players that are lost when accounting for natural aging.

We then looked to see if players progress after signing a contract. The number is definitely lower than teams would hope to see.

	TOI	CF%	CF% Rel	Goals/60	Total Assists/60	First Assists/60	Hits/60	Shots Blocked /60
Players to Progress	187	181	134	165	173	181	191	205
Players > 5% better	132	104	129	159	164	170	150	168
Difference:	55	77	5	6	9	11	41	37

It is most surprising to see less than 50% of players' TOI increasing. It would be logical to think coaches would be encouraged to play players after a team has just committed to them. Its also surprising to see categories where injury risk is increased to be the places where the most players progress

Implications & Further Research

It is my belief that sometimes the impact of player aging is not taken into account as much as it should be in hockey. Teams too often pay for past performance instead of looking at potential future performance. Understanding how players age and how that performance fits into the general team building is critical for teams to successfully navigate the salary cap as they hopefully become Stanley Cup Contenders. One of the most interesting takeaways is that teams should rely on younger players, particularly those on their Entry Level Contracts (ELCs) as they have not yet been disincentivized with a new contract. Furthermore, this is further evidence that teams should be weary of signing unrestricted free agents (UFAs) as they are likely signing them at their peak and see them further disincentivized with a new contract.

An interesting side discovery in this study is coaches seem to be hesitant to cut back on ice time for aging players. Of all the aging curves constructed, the TOI curve showed the slowest decline. It should not be surprising as many coaches still like to lean on "veteran leadership" when situations get tough.

These are places where this research can be improved upon or further:
1. Better method to group players. I think this could be accomplished by a clustering algorithm or maybe through the creation of a similarity score. Part of this process should be to identify statistics that allow us to identify similar players.
2. Potentially use a more advanced statistical test/mathematical formula to determine significant improvement when stripping out aging effects.
3. Look at other potential intervening factors that have not been accounted for in this study. They could include:
   1. Player deployment
   2. Effects of teammates and opponents
   3. Impact of coaching (systems) and potentially changing teams. This could be expanded to include the psychological effects of these changes as well.