Draft Decisions in Uncertain Times: Valuing and Simulating NHL Draft Picks

Meg Ellingwood, Jill Reiner

Advised by Dr. Sam Ventura, Nick Citrone, Ron Yurko

*Zoom
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▶ JASON ZUCKER F

MINNESOTA RECEIVES

ALEX GALCHENYUK F
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CONDITIONAL 2020 FIRST-ROUND PICK
“Conditional 2020 1st Round Pick”

- Condition: If Pittsburgh misses the 2019-20 playoffs, they have the option to send their 2021 1st round pick instead
What is the Draft Lottery?

- Draft lottery format in a normal year
  - Worst 15 teams that did not qualify for the playoffs are entered into a weighted lottery to determine the draft order
- This year’s lottery is different!
  - Pittsburgh has a $\frac{1}{8}$ chance of picking 1st overall and a $\frac{7}{8}$ chance of picking 15th overall
Question/Goals

- **What should the Penguins do with their 1st round pick in the 2020 NHL Draft?**
  - Main options: either keep this year’s or defer and send next year’s
  - **1st goal**: figure out the value of each 1st round draft slot
  - **2nd goal**: predict where the Penguins will finish in the 2020-2021 season to figure out where they will most likely select in next year’s draft
Our Data

- Multiple different data sources, all publicly available
  - Player career statistics from Hockey Reference
  - Team level standard and advanced statistics from Hockey Reference, NHL.com, MoneyPuck.com
  - Historical draft data from Wikipedia and Hockey Reference
• Goal: create a curve valuing each 1st round draft slot
• How do you measure a player’s value to a team?
  ○ Response variable of choice: *Average Point Shares per Season*
    ■ Estimates a player’s contribution to his team in terms of standings points
    ■ Based on marginal goals for and marginal goals against
• To create the curve, we used a linear regression model
NHL Draft Pick Slot Value
2005-2017 NHL Entry Drafts

Average Point Shares / Season

Overall
Predicting next season performance

- Using stats in season $n$ to predict performance in season $n+1$
- Standings point percentage as a response variable
- Per-game and percentage statistics as predictors
  - xG %, Corsi %, shot attempts per game, etc.
Simulating Season Outcomes

Random Forest model of next year’s points %

Randomly select a tree to generate a prediction for teams 1-31

Generate predicted points % for all 31 teams, and rank them

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Repeat 10,000 times to get distribution of possible outcomes
Simulated End-of-Season Ranks for the 2020-21 Pittsburgh Penguins

Mode = 6

Mean = 11.58

10,000 simulations using random forest trees
Simulating draft orders

Simulated Ranking

Best 16 → Worst 15

Simulated Ranking Inverted

Worst 15 → Best 16

Lottery for Top 3 Picks

Middle 12 Picks

Last 16 Draft Picks

Simulated Draft Order
Simulated Draft Pick Spots for the 2020-21 Pittsburgh Penguins

Mean = 20.44
Mode = 26

10,000 simulations of the NHL Draft Lottery based on simulated end-of-season ranks
How do the two year’s picks compare?

- One-number summary of the value of a first-round pick this year versus next year
  - $2020 = \frac{1}{8} \times \text{value of 1st overall} + \frac{7}{8} \times \text{value of 15th overall}$
    - $2.968304$
  - $2021 = \sum (\text{probability of getting that pick} \times \text{value})$
    - $2.212194$

- Based on this, we believe that the Penguins should keep their 2020 1st round selection
Future Work

● Incorporate a more precise playoff performance simulation into model
● Consider assessing the strength of each year’s draft class we are interested in
Thank you!

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Appendix

Data Sources:


GitHub:

https://github.com/mellingwood/CMSACdraftProject

https://github.com/jillreiner/cmsac-penguins
Appendix

References:


### Appendix: Normal year draft lottery odds

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*Draft Lottery Chances*

Micah Blake McCurdy, @IneffectiveMath, hockeyviz.com
Appendix: 2020 draft lottery odds

Draft Lottery Chances
Micah Blake McCurdy, @IneffectiveMath, hockeyviz.com

Team E = Team ?5
2020 NHL Draft Lottery

- This year’s lottery is different! (took place June 26th)
  - 24 team playoff instead of 16 team playoff
  - Still 15 teams in the lottery
    - 7 teams that did not qualify for the playoffs
    - 8 teams eliminated in the “qualifying round”
    - These are “placeholder” spots in the lottery
  - Placeholder Team E won the lottery (!)
  - This means that the Penguins could get the 1st pick (⅛) or the 15th pick (⅝), since they have the highest point percentage of all of the teams in the qualifying round
Importance of This-Season Variables in Predicting Next Year's Success

Using a random forest with 500 trees and 3 randomly selected variables
Appendix: Categorized 2021 pick probabilities

2020-21 Draft Pick Probabilities

- Late 1st Round: 21 to 31
- Mid 1st Round: 11 to 20
- Early 1st Round: 4 to 10
- Lottery Pick: 1 to 3
What can the Penguins do from here?

- What's a fair trade if the Penguins want to trade down?
  - e.g. based on the value curve, pick 17 + a pick in the 2nd round = pick 15
- Trade up to have a higher position in the draft
- Trade for a player who can help the Penguins win now
  - Comparable: Dougie Hamilton trade
    - Boston traded defenseman Dougie Hamilton to Calgary for pick 15 and two picks in the 2nd round