



# Which League is Best?

Comparing the difficulty of  
different hockey leagues across  
the world



By Katerina Wu and Madeline Gall

# Research Questions

- 1) What response variable can be created to compare player statistics controlling for age, league strength, position, etc?
- 2) Which league is the best?  
Which leagues are better?

# Background: Hockey Leagues

- 45 different hockey leagues in the data set
- How to compare them?
- Leagues differ in age
  - Junior hockey leagues, tournaments, NHL
- Leagues differ in games played
  - Tournaments such World Championships
  - Full regular season data for NHL, OHL, AHL, etc
- Leagues located all over the world
  - United States, Russia, Canada, Finland, Switzerland, etc

# Variables

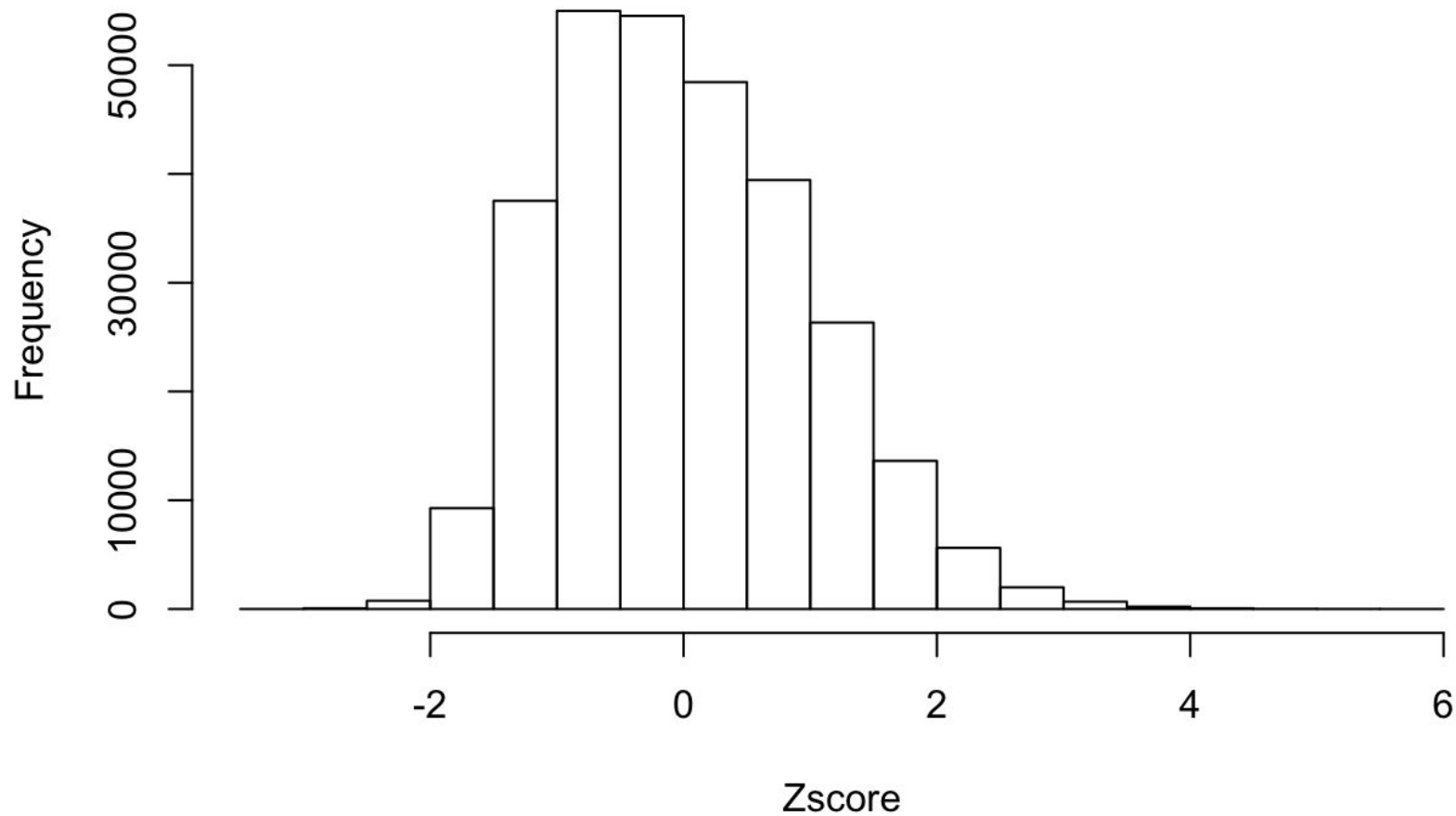
- 18 variables given in original data set
  - Player ID, name, league, season, goals, assists, points per game
- Created age variable for a player's age at a specific season

	player_id	player_name.x	position	league_id	season	PPG	age
1	9	David Bornhammar	D	shl	20002001	0.25	19
2	9	David Bornhammar	D	shl	20012002	0.14	20
3	9	David Bornhammar	D	shl	20002001	0.16	19
4	9	David Bornhammar	D	allsvenskan	20082009	0.44	27
5	9	David Bornhammar	D	shl	20012002	0.15	20
6	10	Rikard Ekström	D	allsvenskan	20062007	0.52	28
7	10	Rikard Ekström	D	shl	20002001	0.40	22
8	10	Rikard Ekström	D	allsvenskan	20072008	0.53	29
9	10	Rikard Ekström	D	shl	19992000	0.50	21

# Response Variable

- Points per Game
  - Total points / Games Played
  - Accounts for different number of games played
- Other ones we created:
  - Goals per Game, Assists per Game, Weighted Points per Game, etc
- Percentile of PPG
  - Controlling for position, league, and age
- Standardized PPG
  - $\log(1+x)$  or  $\sqrt{1+x}$
  - Kind of like a “z-score”

# Histogram of Zscores of Log(PPG)



# Creating ELO model

- 1) **Created subsets of 2 consecutive seasons from data**
  - a) Ex: subset by season being 2017/2018 or 2018/2019
- 2) **We made a new dataset merging the same subset together by player id**
  - a) Selected 10 variables from this data set and regular season observations only
- 3) **Created matrix**
  - a) 0 = league was not being compared at the time
  - b) 1 = league was being used
  - c) -1 = second league being used
- 4) **Ran logistic regression model**
- 5) **Value of coefficients determined league strength**

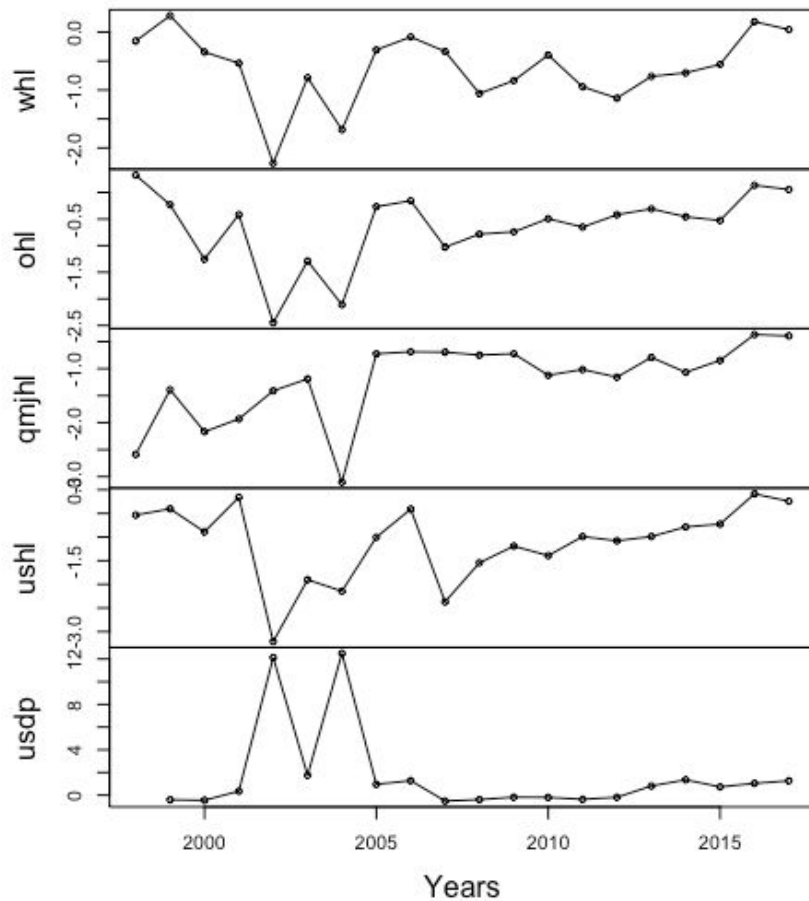
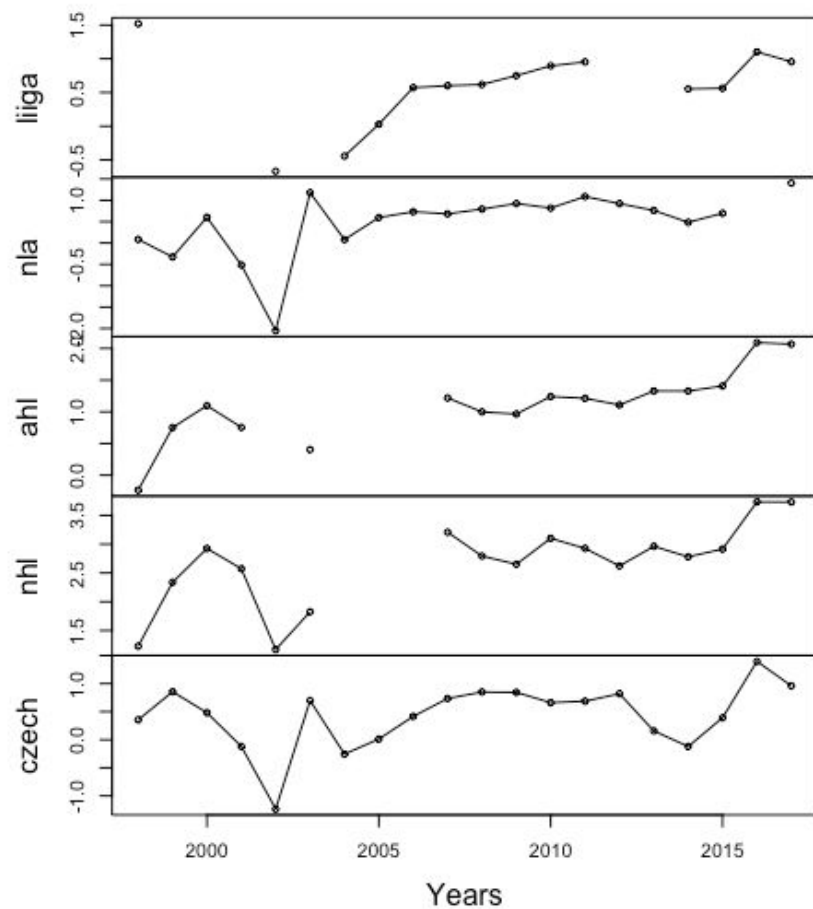
# Using Bradley Terry Model Package

Similar to self-created ELO model:

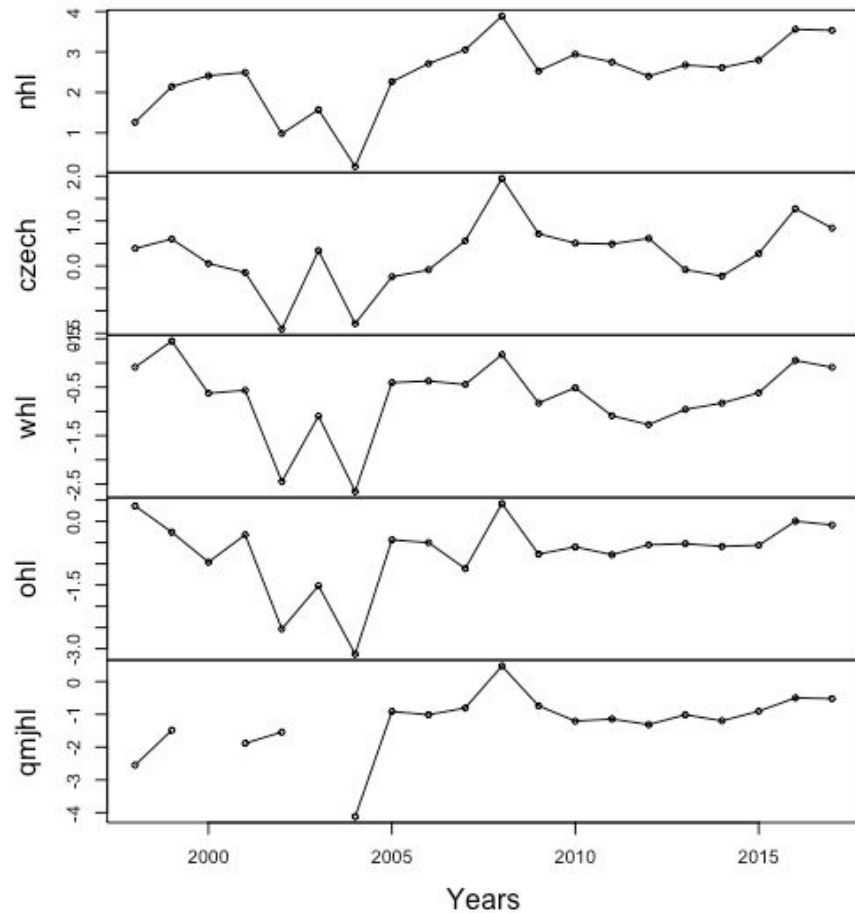
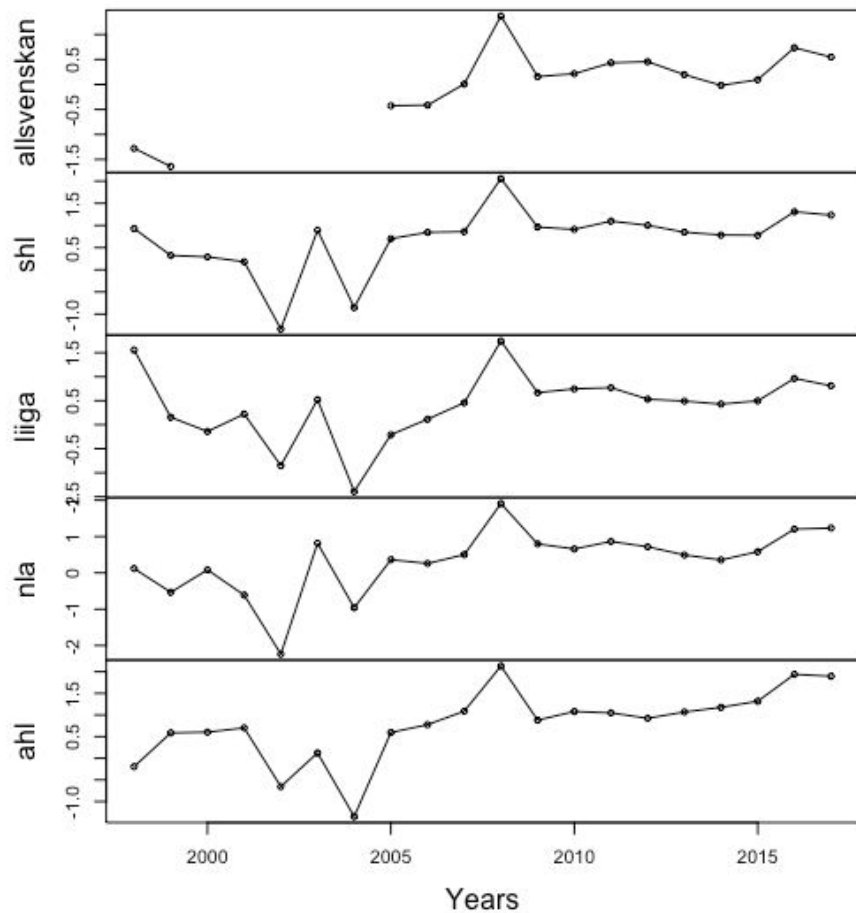
- 1) Created subsets of 2 consecutive seasons from data**
  - a) Ex: subset by season being 2017/2018 or 2018/2019
- 2) We made a new dataset merging the same subset together by player id**
  - a) Selected 10 variables from this data set and regular season observations only
- 3) Transformed dataframe into something BTM function could read**
  - a) Specified which variables we were comparing, etc
- 4) Value of coefficients determined league strength**



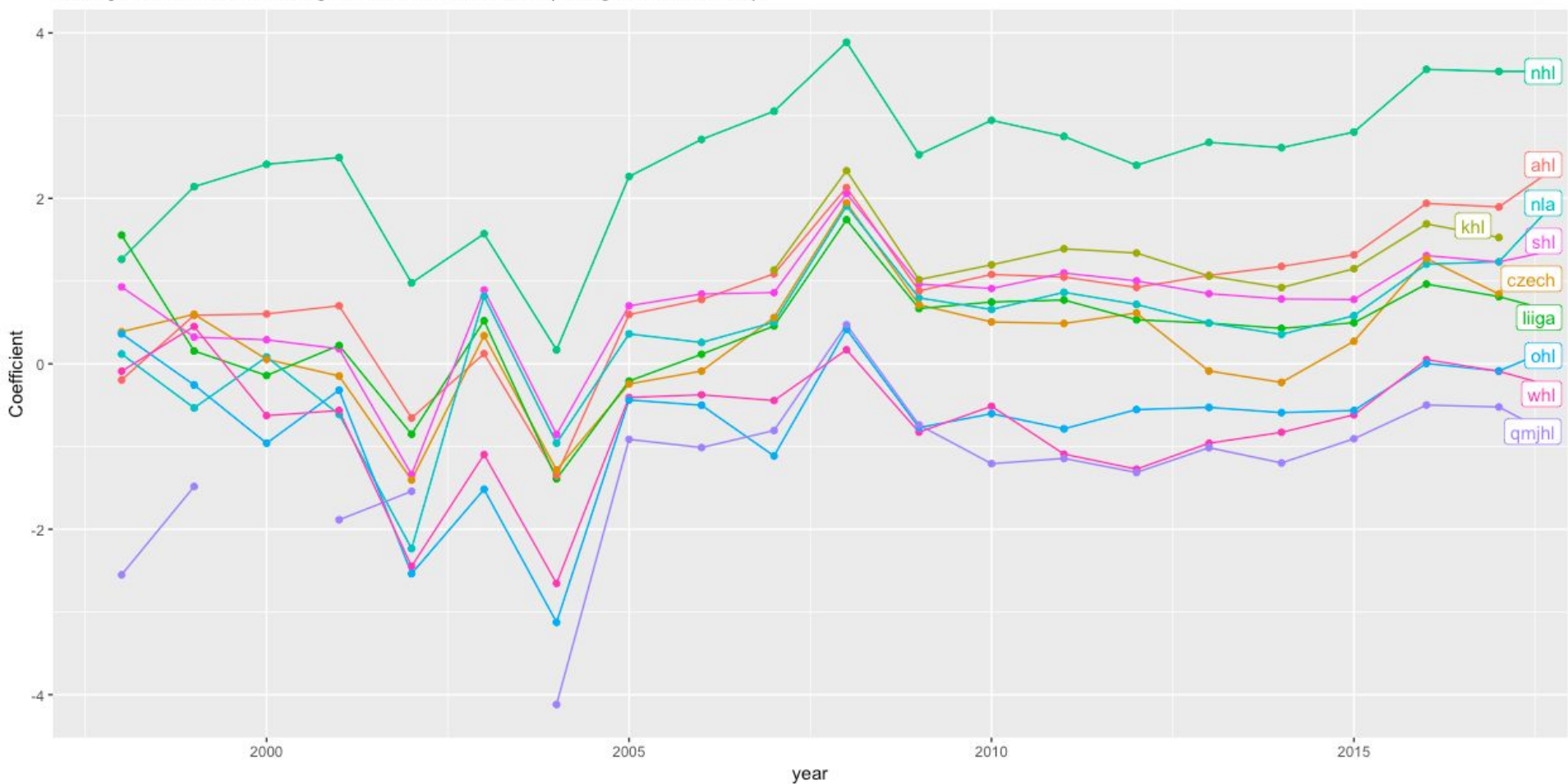
## League Strength over time using Adjusted PPG



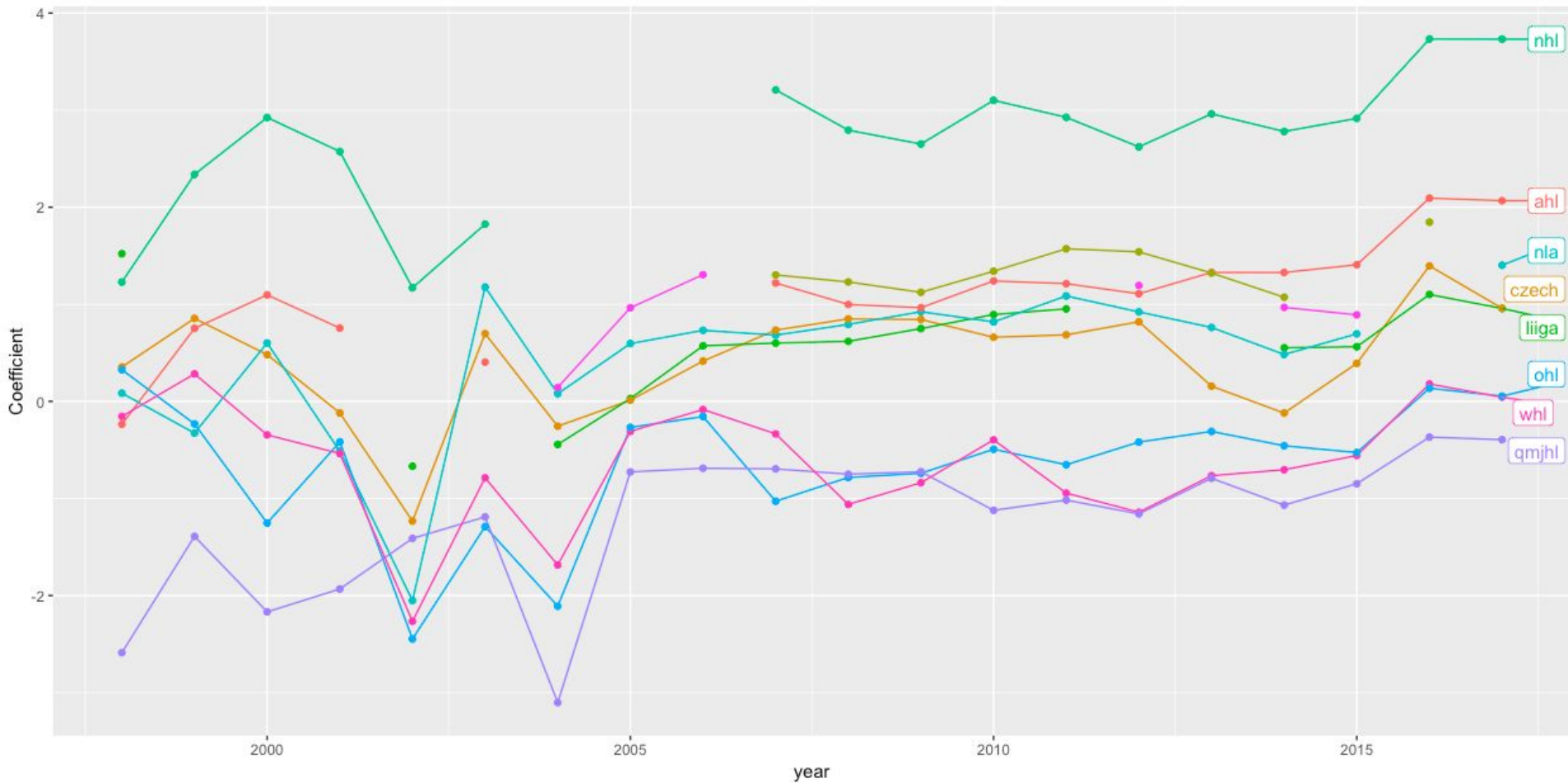
# League Strength over time using Adjusted PPG



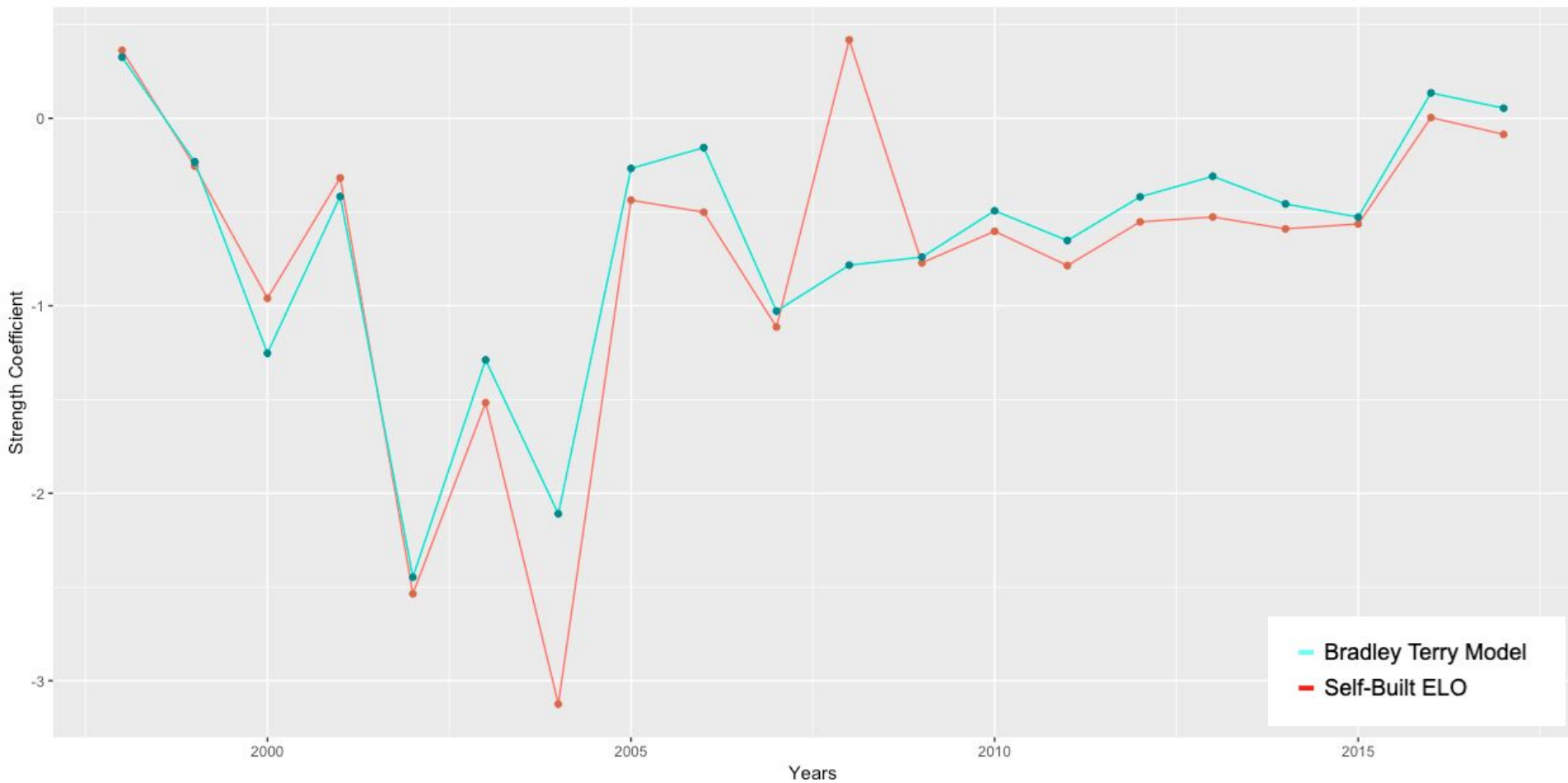
Strength Coefficient of Leagues Over 20 Seasons (Using self-built ELO)



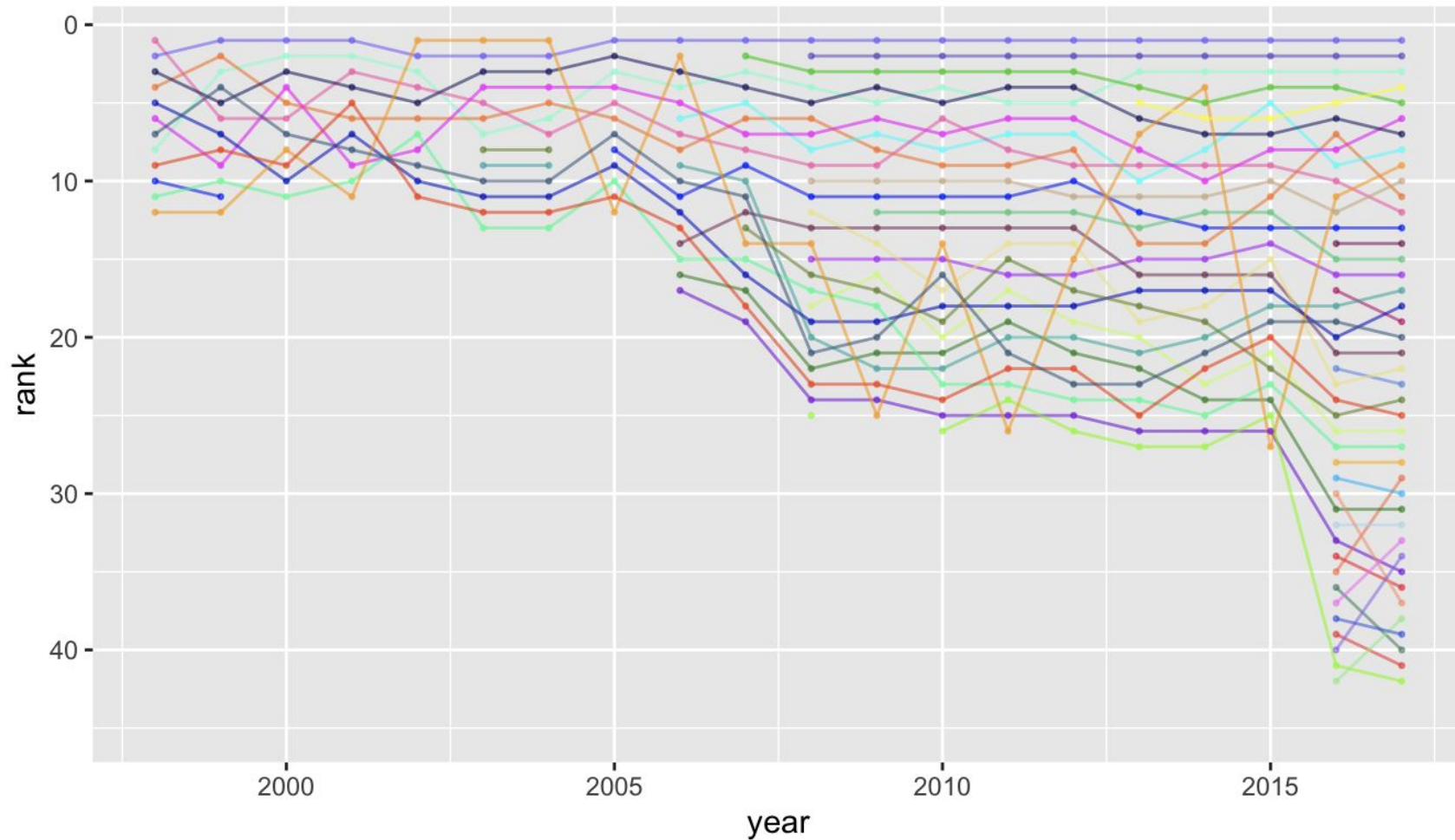
Strength Coefficient of Leagues Over 20 Seasons (Using BTM)



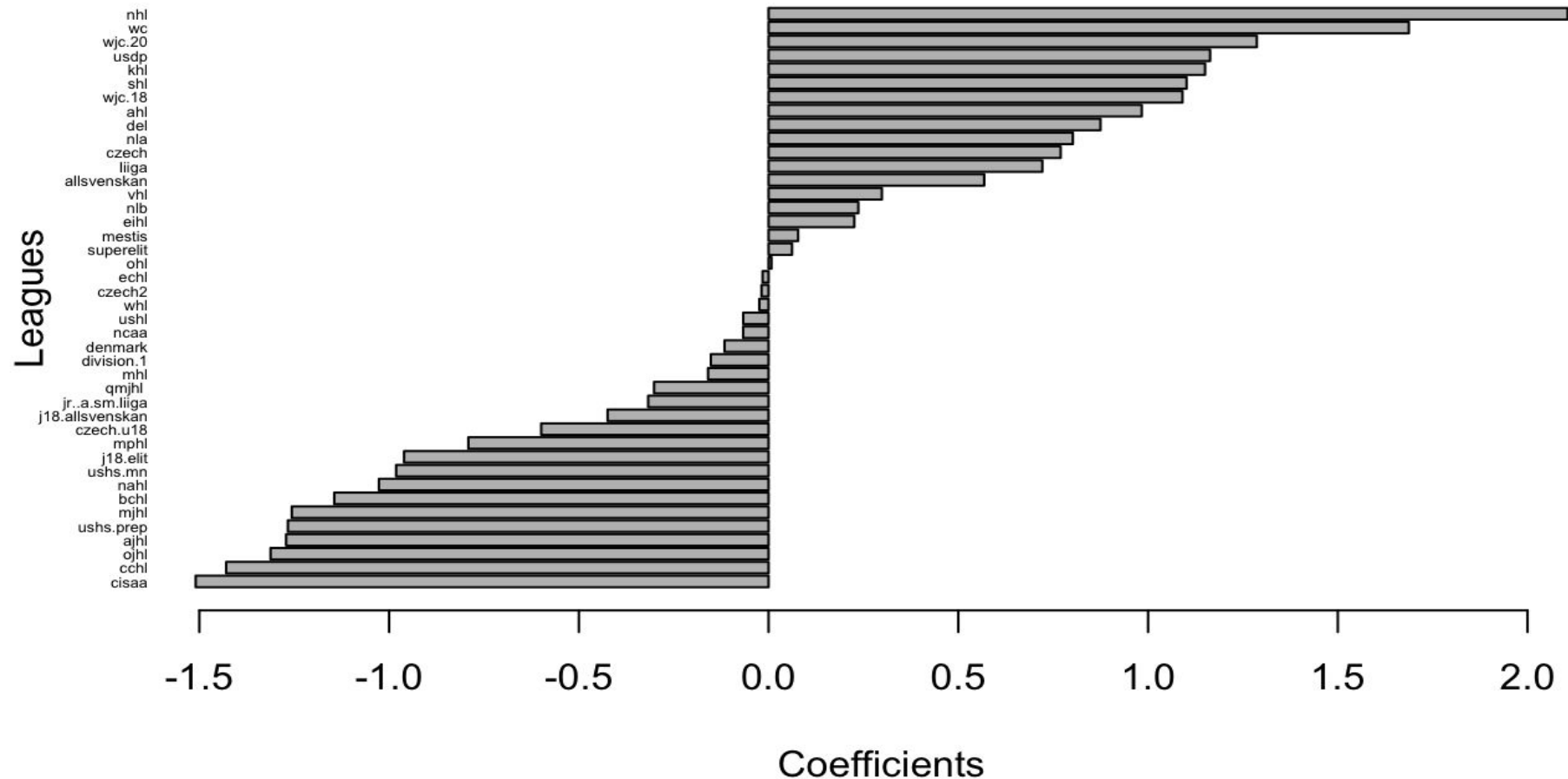
Bradley Terry vs Self-Built ELO



# Ranking Hockey Leagues



# Hockey League Rankings Conditioning for Age

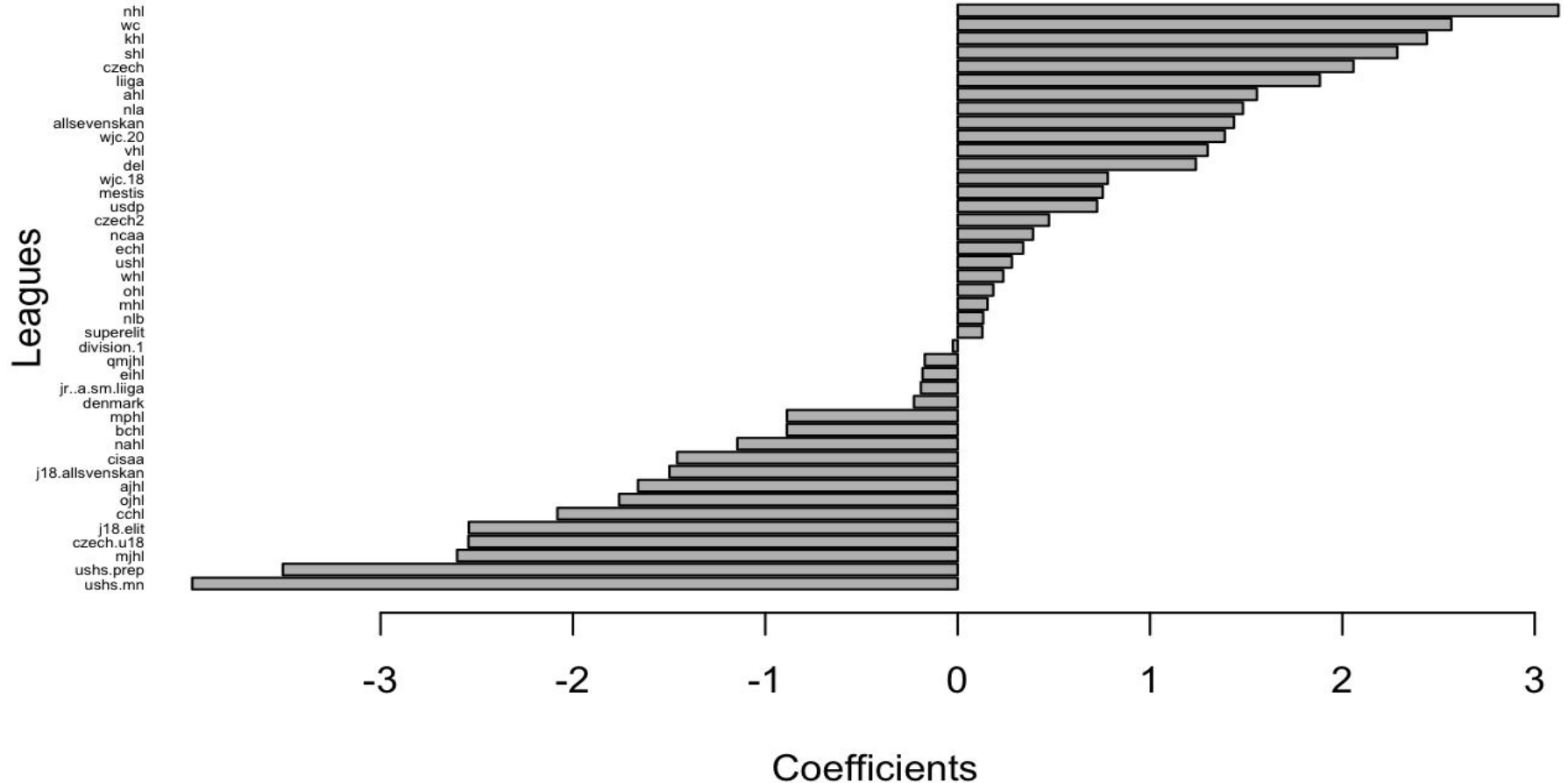


# Top 20 Ranking Using Adjusted PPG

League	Rank	League	Rank	League	Rank	League	Rank
NHL	1	shl	6	czech	11	eihl	16
wc	2	wjc.18	7	liiga	12	mestis	17
wjc,20	3	ahl	8	allsvenskan	13	superelit	18
usdp	4	del	9	vhl	14	ohl	19
khl	5	nla	10	nlb	15	echl	20



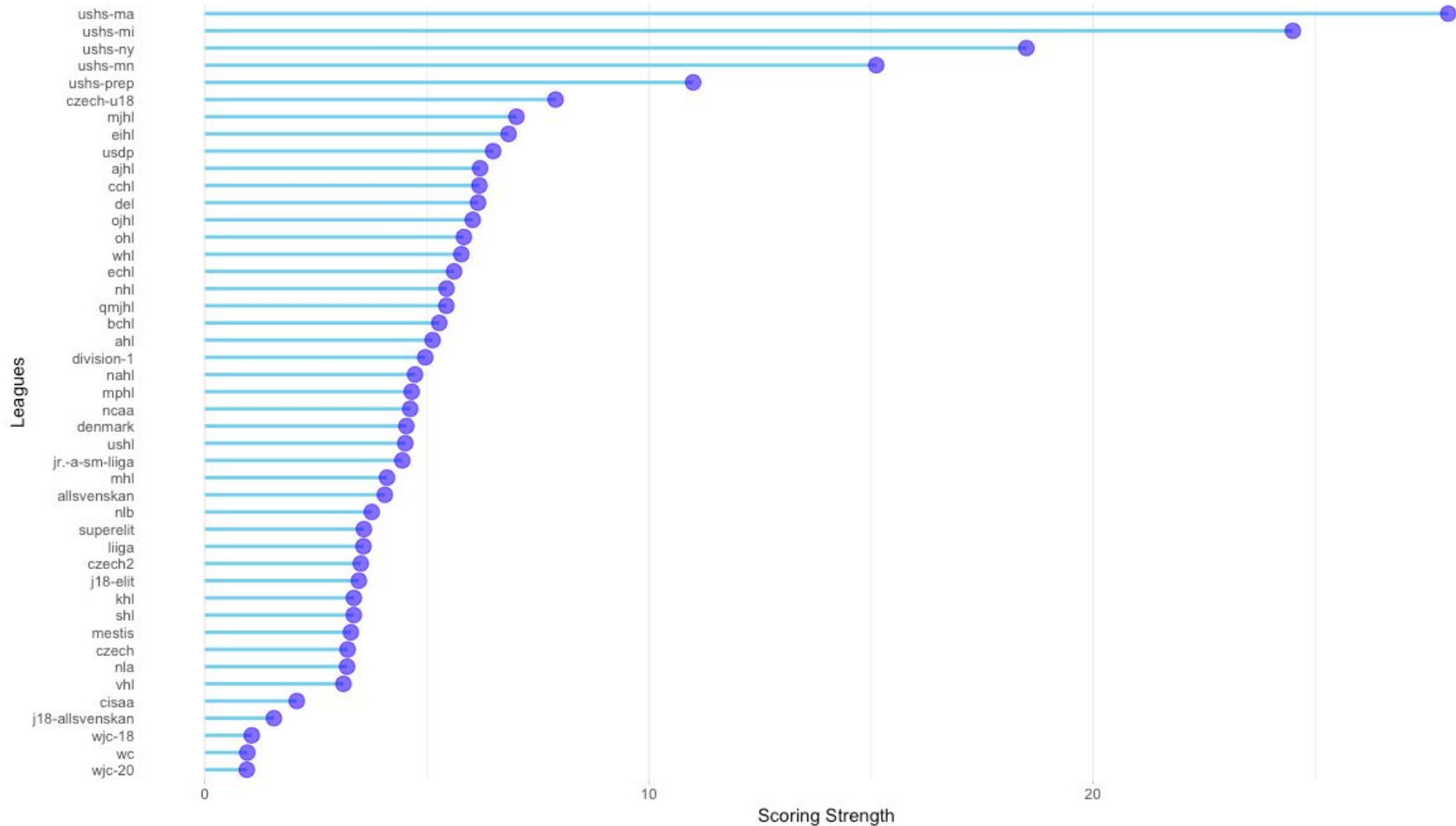
# Hockey League Rankings using Raw PPG



# Top 20 Ranking Using Raw PPG

league	Rank	League	Rank	League	Rank	League	Rank
NHL	1	Liiga	6	VHL	11	Czech2	16
WC	2	AHL	7	DEL	12	NCAA	17
KHL	3	NLA	8	Wjc.18	13	ECHL	18
SHL	4	allsvenska n	9	Mestis	14	USHL	19
Czech	5	Wjc.20	10	USDP	15	WHL	20

# Scoring Strength by League



# Current issues/problems

- How to explain certain drops and peaks in data
  - How to explain 2008? etc
- Too many leagues; how to display results?
  - Remove or highlight some leagues
  - Will it still give us the “whole” picture?
  - Labeling leagues is difficult
- USDP ranking is not consistent
- BTM creates missing data

# Future Implementations

- Find a way to weigh certain leagues by number of games played
  - tournaments are considered leagues in dataset
  - Playoffs vs regular season
- Create a time analysis to assess the leagues and predict what league strength will be next year
- Look at scoring rates for each league (in progress)
- How can we predict future prospects?
- These models built only using forwards and defensemen
  - How do goalies play into this?



**Thank You!**