Shootout or Crapshoot:
An Analysis of the NHL Shootout after Five Years

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Source: gettyimages.com

Introduction

Beginning in 2005-6 NHL Season
Shootout (SO) new method for game outcomes after OT
Shootout eliminated ties from NHL standings
Each team names 3 shooters
Tied after 3 shooters continue until winner determined
Both teams must take same number of shots
Statistics of shootout do not count for individual statistics
Not used in NHL playoffs, multiple overtimes
April 2010 Flyers beat Rangers in SO for playoffs

Research Question: Is there skill involved in a shootout (or is outcome random chance)?

Data

5711 NHL shootout shots from 05-06 to 09-10
- Name of 571 shooters
- Name of 112 goalies
- Outcome(Goal or Not)
- 1878 goals (**32.88**% success rate)

Prominent Player Results:

Shooters:

Henrik Sedin	0/2 (0.0%)
Sidney Crosby	20/48 (41.7%)
Alex Ovechkin	13/47 (27.6%)
Daniel Alfredsson	11/33 (33.3%)
Evgeni Malkin	6/26 (23.1%)
Ilya Kovalchuk	9/37(24.3%)
Jonathon Toews	14/26(53.8%)
Martin St. Louis	5/24(20.8%)

Goalies

Martin Brodeur	52/182(28.6%)
Evgeni Nabokov	54/145(37.2%)
Ilya Bryzgalov	42/124(33.9%)
Ryan Miller	48/157(28.7%)
Roberto Luongo	45/155(29.0%)

Model

Following Albert and Chib (1993), let

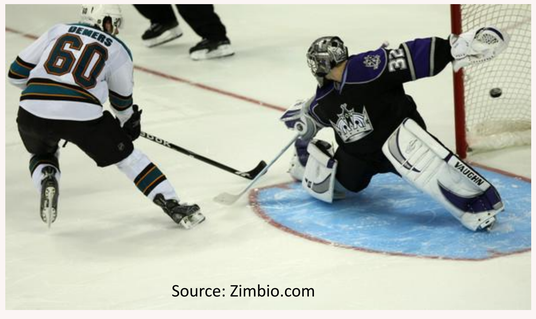
$$y_i \sim \text{Bernoulli}(\pi_i)$$

for the i^{th} shootout shot with

$$\pi_i = \Phi(\mu + \alpha_k + \beta_j)$$

Where μ is the overall mean,
α_k is the shooter efffect (k=1,…,571) and
β_j is the goalie effect (j=1..112) and
Φ is the cumulative Gaussian/Normal distribution

Prior distribution $(\mu,\underline{\alpha},\underline{\beta})^T \sim N(0,100)$


Source: Zimbio.com

Analysis

Posterior generated using MCMCprobit from MCMCpack in R.

4 chains of 50000 (taking every 50th iteration)

Burn-in of 1000 iterations

Convergence for each parameter using Gelman & Rubin criteria (gelman.diag in MCMCpack)

Results

Among players with more than 10 shots,
99% CI's all α_k's and β_j contain 0 except

Goalies

Marc Denis	***6/41(14.6%)***

Shooters

Michael Frolik	1/11 (9.1%)
Marian Gaborik	2/18 (11.1%)
Martin Havlat	3/18 (16.7%)
Dany Heatley	4/25 (16.0%)
Tomas Plekanec	2/16 (12.5%)
Alexei Ponikarovsky	1/12 (8.3%)
Taylor Pyatt	1/13 (7.7%)
Bobby Ryan	1/11 (9.1%)
Michael Ryder	4/22 (18.2%)
Stephen Weiss	4/24 (16.7%)

Conclusions/Next Steps

- Mostly CRAPSHOOT
- Evidence that some shooters are worse than league average
- No evidence that some shooters are better than league average
- Choice of N(0,100) very flat prior heavily assume player differences
- Better model: full hierarchical Bayesian model with terms for average goalie and average shooter effect
- NHL rule change for 2010-11
  - Tiebreaker for regular season standings
  - No longer includes Shootout Wins
  - Only regulation and overtime wins

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