COMPETITIVENESS: THE NATIONAL FOOTBALL LEAGUE VERSUS MAJOR LEAGUE BASEBALL WITH AN APPLICATION TO INDUSTRY COMPETITIION

Anthony Stair, Frostburg State University
astair@frostburg.edu

Daniel Mizak, Frostburg State University
dmizak@frostburg.edu

ABSTRACT

This paper attempts to measure the level of competitiveness in Major League Baseball, the National Football League, and the cell phone industry using an index titled the churn. This analysis found that the difference in the level of competitiveness between the NFL and MLB is smaller than anticipated. The results also indicate that the level of competitiveness varies greatly across divisions in the NFL. The churn was also successfully applied to the cell phone industry. However, the use of the churn to measure industry competitiveness may be limited to mature oligopolistic industries.

INTRODUCTION

Over the past several decades, competitive balance has become an increasingly prominent topic in the economics of professional sports. One of the factors likely contributing to a lack of competitive balance in professional sports leagues is the absence of a salary cap. In Major League baseball, teams like the Yankees spend much more on players' salaries than other teams. Logic suggests that this would lead to competitive disparity. In an attempt to alleviate the competitive disparity in MLB due to the lack of a salary cap, the league has instituted limited revenue sharing between teams. If a team spends more on team payroll than a specified limit, that team must pay a percentage payroll tax which is distributed to lower payroll teams.

The National Football League, on the other hand, does employ a salary cap which limits the payroll disparity across teams. As a result, the competitive disparity in the National Football League should be less than the competitive disparity in Major League Baseball. This may lead to more fan interest in the National Football League than in Major League Baseball. This article uses the adjusted churn index introduced by Stair et al. (2004) to examine the level of competitive disparity in MLB and the NFL. Finally we introduce the use of the adjusted churn to measure the degree of competition in industry by applying it to the cell phone industry.

In this paper, we propose a measure of competitive balance that captures these changes in the final standings of a league or division from season to season.

LITERATURE REVIEW

Many of the studies of competitive balance in sports leagues focus on the dispersion of winning percentages among teams during a particular year. This dispersion is measured in a number of different ways, including the standard deviation (SD) of winning percentages (Schmidt & Berri, 2002); the Gini coefficient (Utt & Fort, 2002) (Schmidt & Berri, 2002, 2003); the Hirfindahl-Herschman index (HHI) (Eckard, 2001); and the index of dissimilarity (Mizak & Stair, 2004). These measures fail to capture changes in competitive balance that manifest themselves across seasons. Several other articles have attempted to measure the changes in competitive balance across seasons.

Butler (1995) measured the correlation between each team's winning percentage between consecutive seasons. Humphreys (2002) created a new "Competitive Balance Ratio" (CBR)—the ratio of the average standard deviation of each team's won-lost percentage across seasons to the average standard deviation in won-loss percentages across teams in each season. Hadley, Ciecka, and Krautmann (2005) focus on final team standings to measure competitive balance. Their analysis is based on which teams make the play-offs. Borooaha and Mangan (2012) utilized a general measure of competitive balance based on the Generalized Entropy (GE) approach to measuring inequality. They applied this technique to the results [from the 2006 - 2007] season of the English Premier League (EPL). They used the results of their analysis to determine how competitive balance affected league welfare. Owen (2010) found that using ordinary standard deviations as a measurement of competitive balance is flawed. He found that ordinary standard deviations have an upper bound that varies based on the number of teams and games played. He found that making an adjustment to ordinary standard deviations based on this upper bound provided additional insights into competitive balance. Although these articles attempt to measure changes in competitive balance over several years, only Stair, Mizak and Neral (2007) have attempted to develop an index which serves as an indicator of competitive balance in major league sports over time.

ANALYSIS

Background

The adjusted churn is an index which attempts to measure the degree of competitiveness in sports by measuring the turnover in standings from one year to the next. The adjusted churn for 2014 measures the change in standings from 2013 to 2014. This index was first introduced by Stair et al. (2006). The information that follows is based on that article.

Let C denote the league's year-over-year average team movement in the standings, where C_t (Churn) is computed as:

$$C_t = \sum_{i=1}^{n} \left| f_{i,\,t} - f_{i,\,t-1} \right| \Big/ n$$

FIGURE 1

Where: Ct = the churn in team standings for year t, $|f_{i,t} - f_{i,t-1}|$ is the absolute value of the i-th team's change in finish from season t-1 to season t, and n is the number of teams.

What follows is a simple example to illustrate how the churn is calculated.

TABLE 1: EXAMPLE CHURN CALCULATION

Team	2013 final rank	2014 final rank	lfi,t – fi,t-1l
A	1	4	3
B	2	3	1
C	3	2	1
D	4	1	3

In the above data $\sum|f_{i,t} - f_{i,t-1}| = 8$ The churn for 2007 = 8/4 = 2 This is the maximum value of the churn given a league size of 4 teams. It can be shown that in a league with an even number (n) of teams, C will vary between 0 and .5n. For leagues with an odd number (n) of entries, C varies between 0 and $(n^2 - 1)/2n$. Note that years involving league expansion (or contraction) must be excluded since there will be insufficient data for the team(s) in question.

One problem is that the maximum potential value of the churn varies depending on league size. Since league size (and hence the coefficient's upper bound) varies over time, and even across divisions in some leagues, inter-temporal and interdivision comparisons require that the churn coefficient, C, be divided by its maximum value. In the above example, the churn divided by its maximum value would equal 1. Henceforth, in this paper the term *churn* will mean this adjusted version, and it will be the measure that we will use to indicate the degree of change in league

standings over time. It allows us to compare the degree of competitive balance in leagues or divisions with differing numbers of teams.

A churn = 0 indicates no change in league or division standings from one year to the next and implies a complete lack of competitive balance in that league or division. A churn =1 indicates the maximum possible change in league standings from one year to the next and implies maximum possible competitive balance over time.

Analysis for Football

Below is the churn calculated for the NFL for each division, conference, and total for 2003–2013. Larger churns indicate greater turnovers in standings from year to year and by implication a greater level of competition. Based on this analysis, the AFC East has been the least competitive division in the NFL over this 10 year period. The NFC South has been the most competitive division in the NFL over this 10 year period. The Churn also indicates that there has been greater turnover in the standings in the NFC than the AFC over this 10 year period.

TABLE 2: CHURN DATA FOR NFL

NFL	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Churn											
AFC East	0.63	0.50	0.50	0.50	0.25	0.63	0.38	0.00	0.00	0.38	0.13
AFC North	0.50	0.50	0.50	0.50	0.63	0.50	0.38	0.63	0.25	0.25	0.13
AFC South	0.50	0.50	0.25	0.25	0.25	0.75	0.50	0.38	0.88	0.50	0.75
AFC West	0.50	0.63	0.50	0.50	0.13	0.25	0.38	0.75	0.88	0.63	0.50
NFC East	0.50	0.38	0.63	1.00	0.75	0.38	0.50	0.38	0.50	0.75	1.00
NFC North	0.00	0.25	0.75	0.50	0.63	0.63	0.25	0.63	0.63	0.50	0.25
NFC South	0.75	0.75	1.00	0.75	0.50	0.75	0.75	0.50	0.50	0.63	0.50
NFC West	0.50	0.50	0.00	0.25	0.50	0.50	0.00	1.00	1.00	0.63	0.38
Churn	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AFC	0.53	0.53	0.44	0.44	0.31	0.53	0.41	0.44	0.50	0.44	0.38
NFC	0.31	0.34	0.59	0.56	0.47	0.44	0.38	0.38	0.41	0.47	0.44
Overall	0.42	0.44	0.52	0.50	0.39	0.48	0.39	0.41	0.45	0.45	0.41

C. Analysis for Baseball

Below is the churn calculated for the MLB for each division, league, and total for 2003–2013. Larger churns indicate greater turnovers in standings from year to year and by implication a greater level of competition. Based on this analysis, the AL West division has been the most competitive division in the MLB over this 10 year period. Its average Churn of .57 is larger than the second highest Churn of .50 for the NL Central. The NL East has been the least competitive

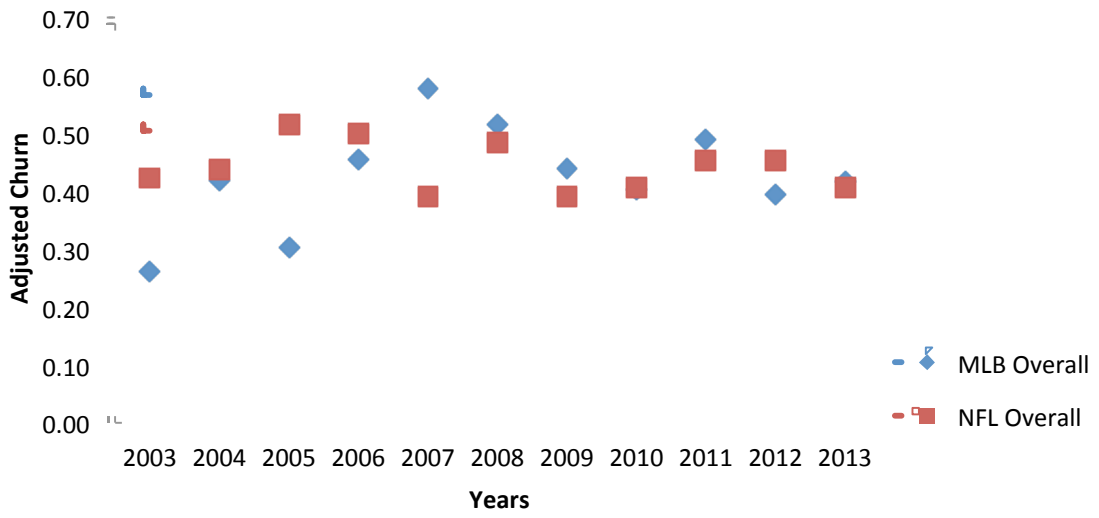
division in the MLB based on average Churn over this 10 year period. The Churn also indicates that there has been greater turnover in the standings in the National League than the American League over this 10 year period. The National League has a 10 year average churn of .43 and the American League average churn for the same period is .42.

TABLE 3: CHURN DATA FOR MLB

MLB	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	10 year Avg
Churn												
AL East	0.00	0.33	0.33	0.33	0.33	0.67	0.33	0.33	0.17	0.50	0.67	0.36
AL West	0.20	0.40	0.40	0.80	0.60	1.00	0.80	0.20	1.00	0.33	0.50	0.57
AL Central	0.21	0.63	0.00	0.21	0.63	0.42	0.21	0.63	0.21	0.42	0.00	0.32
NL East	0.33	0.33	0.00	0.50	0.33	0.33	0.33	0.17	0.33	0.33	0.33	0.30
NL West	0.56	0.42	0.42	0.42	0.97	0.14	0.56	0.56	0.56	0.28	0.50	0.49
NL Central	0.27	0.40	0.67	0.47	0.60	0.53	0.40	0.53	0.67	0.50	0.50	0.50
Churn												
AL	0.14	0.45	0.24	0.45	0.52	0.69	0.45	0.39	0.46	0.42	0.39	0.42
NL	0.39	0.38	0.36	0.46	0.64	0.34	0.43	0.42	0.52	0.37	0.44	0.43
MLB Overall	0.26	0.42	0.30	0.45	0.58	0.51	0.44	0.40	0.49	0.39	0.42	0.42

Comparison of the Churn for MLB to the Churn for the NFL

In this article we initially speculated that the competitive balance in the NFL would be greater than the competitive balance in MLB due to the salary cap that exists in the NFL, and therefore the churn for the NFL should be greater than the churn for MLB. As indicated by the graph below, this has not been consistently true over the past 10 years. From 2007 until 2009 the churn was greater for MLB than the NFL. This was unexpected. Conventional wisdom suggests that there is much greater turnover in the standings in the NFL than MLB. Perhaps this indicates that the revenue sharing tax used by major league baseball is significantly enhancing competitive balance in MLB. In fact, the overall average churn for MLB over this 10 year period is .42 and the overall average churn for the NFL is .44. This indicates over this 10 year period there is no apparent difference between the competitive balance in MLB and the NFL.



Adjusted Churn for MLB and NFL 2003 -2013

FIGURE 2

An Application to Business

The churn can be applied to industries to measure the competitive balance as indicated by the turnover in rankings based on total revenue or net revenue. As an initial example, we calculated the churn for the top 5 firms in the cell phone industry based on total revenue and net revenue. The churn indicates that in 2010 and 2013 there was a greater change in the rankings of the firms in the cell phone industry than in 2011 and 2012.

TABLE 4: GROSS INCOME FOR THE TOP 5 PUBLICLY TRADED CELL PHONE PROVIDERS

Gross Income					
Phone Companies	**2009**	**2010**	**2011**	**2012**	**2013**
Verizon	48,970,000,000	46,010,000,000	48,500,000,000	53,150,000,000	59,060,000,000
T-Mobile	934,250,000	1,100,000,000	1,300,000,000	1,400,000,000	1,530,000,000
AT&T	52,430,000,000	52,620,000,000	50,970,000,000	54,080,000,000	58,890,000,000
Sprint		32,563,000,000	33,679,000,000	35,345,000,000	35,493,000,000
US Cellular	2,100,000,000	2,000,000,000	2,060,000,000	1,960,000,000	1,350,000,000

TABLE 5: CHURN BASED ON GROSS INCOMEFOR THE TOP 5PUBLICLY TRADED CELL PHONE PROVIDERS

Gross Income				
Phone Companies	**2010**	**2011**	**2012**	**2013**
Churn	0.00	0.00	0.00	0.42

TABLE 6: NET INCOME FOR THE TOP 5 PUBLICLY TRADED CELL PHONE PROVIDERS

Net Income					
Phone Companies	**2009**	**2010**	**2011**	**2012**	**2013**
Verizon	3,650,000,000	2,550,000,000	2,400,000,000	875,000,000	11,500,000,000
T-Mobile	149,440,000	176,160,000	192,400,000	298,580,000	391,810,000
AT&T	12,120,000,000	19,090,000,000	3,940,000,000	7,260,000,000	18,250,000,000
Sprint		3,465,000,000	2,890,000,000	4,330,000,000	3,020,000,000
US Cellular	216,010,000	132,320,000	175,040,000	111,010,000	140,040,000

TABLE 7: CHURN BASED ON NET INCOME FOR THE TOP 5 PUBLICLY TRADED CELL PHONE PROVIDERS

Net Income				
Phone Companies	**2010**	**2011**	**2012**	**2013**
Churn	0.42	0.00	0.00	0.42

CONCLUSIONS

The churn indicates that the difference in the level of competitiveness between the NFL and MLB is smaller than anticipated. This indicates the competitive outcome of revenue sharing in MLB may be similar to the competitive outcome of a salary cap in the NFL.

Within the NFL, the churn indicates a varying level of competitiveness across divisions. The Eastern Division in the American Conference has been much less competitive than the National Conference South Division. This may be partly due to stability or lack thereof at quarterback in these respective divisions.

We found the churn can be applied to industries to measure the level of competitiveness. However, the churn may be best applied to industries where there is not much change in the firms involved in the industry. It therefore would be somewhat ill-suited for either highly competitive industries or industries still maturing. It is perhaps best suited for mature oligopolistic industries, but even here the possibility of mergers (or bankruptcies) weakens its usefulness.

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