NHL ALL-STARS AND THIR AFFECT ON TEAM WINS

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

Stephen F. Schultz

May 2011

\

NHL ALL-STARS AND THIR AFFECT ON TEAM WINS

Stephen F. Schultz

May 2011

Economics

Abstract

Over the years studies have been documented to test whatever interests the human eye. Studies have been done on anything from economic trends to sports. This brings us to the testing of all stars in the National Hockey League. People may ask, well why is this paper important? Over the years studies have been compiled in the other major sports testing to see if all stars affect team wins but none have been done regarding the all stars in the National Hockey League. An all star player is defined as a player in a particular sport who has been selected for the All-star game. The purpose of this paper is to come to a conclusion, through regression analysis, if all stars in the National Hockey League have an effect on their team's wins.

KEYWORDS: (All-star, NHL, Wins)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MODELS

CHAPTER I

INTRODUCTION

"When you take off that sweater, your jersey, after today's game, you will be the last player in the NHL to ever wear 99. You have always been and you will always be 'The Great One,' and there will never be another."[1]— Gary Bettman on the retiring of Wayne Gretzky's number 99. Wayne Gretzky is one of the most famous National Hockey League players to ever play the game of hockey. He is and will always be considered an all-star or a superstar player. An all-star is composed wholly or chiefly of stars or of outstanding performers or participants.[2] These outstanding performers are what attracts fans to games and keeps the game progressing into new levels of achievement. Unfortunately, these players tend to demand the most money due to their great performance and can be very costly to a team. This was not much of an issue before the season ending lockout in the National Hockey League due to no salary cap; however; that changed when the board of commissioners realized that the National Hockey League was spending way too much of their revenue on player salaries.

The following study looks at the affects of how all-stars affect team wins. Along with all-stars, this study will be looking at other factors that affect team wins such as standings, revenue, salary, and attendance. The analysis will show the impact that all-stars as well as other factors have on team wins in the National Hockey League.

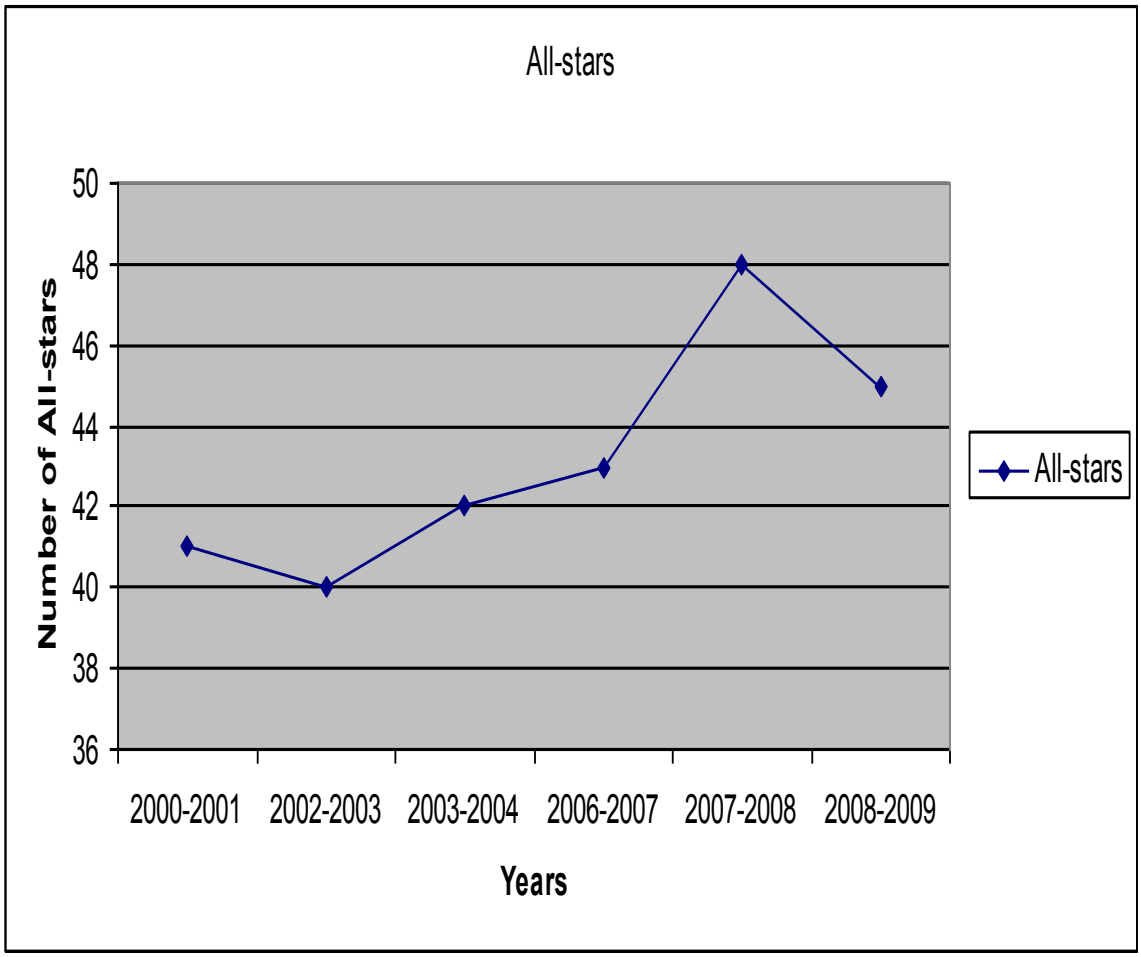
[1] Edward Moran. "It Was A Great Send-Off." Philly.com. http://articles.philly.com/1999-04-
[2] Merriam Webster Dictionary, 2011. http://www.merriam-webster.com/dictionary/all-star

Purpose

The purpose of this study is to examine the impact that all-stars have on teams wins since the 2000-2010 seasons. This will show the impact of all-stars on a team wins before the lockout as well as after the lockout. All-stars have increased in the past few years in the National Hockey League. All-stars in the NHL can be determined by looking at who plays in the all-star game. The all-star game is played every year, unless it is an Olympic year. The following chart shows the increase in all-stars over the past ten seasons in the National Hockey League.

Figure 1.1

All-Stars in the National Hockey League



All-stars were not recorded for the 2004-2005 season due to a season ending lockout where there was no games played. The 2001-2002 year was an Olympic year causing there to be no all-star game and also in 2005-2006 as well as 2009-2010 there was also Olympic years so therefore there was no all-star games for that years either. All-stars have increased in the past ten years and it is important to see if they truly impact a team's wins. After the lockout, there was a large increase in the amount of all-star players in the NHL. Along with a larger number of all-stars, there were other changes brought on from the season ending lockout.

The season ending lockout came about due to the National Hockey League board deciding that there should be a salary cap on player spending. Before the lockout teams spent about 75% of total revenue on player's salaries.[3] This was way more than any other league spent on their players. So the NHL decided to implement a salary cap. The NHL Salary Cap is the limit to the total amount of money that the National Hockey League teams are allowed to pay their players and uses a "hard" cap, meaning there are no luxury taxes or exemptions.[4] The lockout lasted 310 days which ended the entire season. This was the longest any sports teams have gone without playing before. So what is the difference? How has the salary cap changed the game?

Before the lockout there were a few differences besides just a salary cap. Many people may think that teams who have the most money will then be able to buy whoever they want and just stack their team. This was not the case for the National Hockey League. The league, in an attempt to disallow teams from stacking players, had stricter

---

[3] Dan Diamond (1991). *The Official National Hockey League 75th Anniversary Commemorative Book*. McClelland & Stewart. pp. 69.

[4] Article 11, Section 11.17, "Currency". *Collective Bargaining Agreement between the National Hockey League and the National Hockey League Players' Association*. July 22, 2005.

free agency rules. The free agency system left most NHL players a part of one team from the day they were drafted until the age of thirty one. After that age, the players became “unrestricted” and were free to take the highest offer from other teams around the league. By doing this, owners limited a player’s earning by forcing him to one team during his prime athletic years as a professional player. The ultimate goal of this action was to prevent runaway salary escalation. Players in their later twenties could qualify for “restricted” free agency. In that case, players could give their current team a right to match any contract off from elsewhere. Many times mediocre players were paid far too much because of this rule. For example, in 1997 Joe Sakic of the Colorado Avalanche signed a three-year, $21-million US "offer sheet" with the New York Rangers. But Colorado exercised its right to match the offer and retained him. Sakic went nowhere, and the only result of the Rangers' gambit was to more than double his salary.[5] Players could end up doubling their contracts as “restricted” free agents causing the owners a lot of money that they otherwise would not have paid the player before. These small rules helped the National Hockey League stop teams from stacking players. So although there was no salary cap and player spending was at an all time high, teams still were unable to fully stack their teams to create super teams. After the lockout, teams are still unable to stack their teams with the best of players, but for different reasons than before the lockout.

Before the lockout, unrestricted free agency and restricted free agency rules stopped teams from spending all of their money to buy the best of the best players and form super teams. The lockout caused for a few changes to be made. These changes are;

[5] James Fitzpatrick. “Why didn’t the NHL do something about spiraling salaries before?” About.com. http://proicehockey.about.com/od/collectivebargainingfaq/f/origins.htm

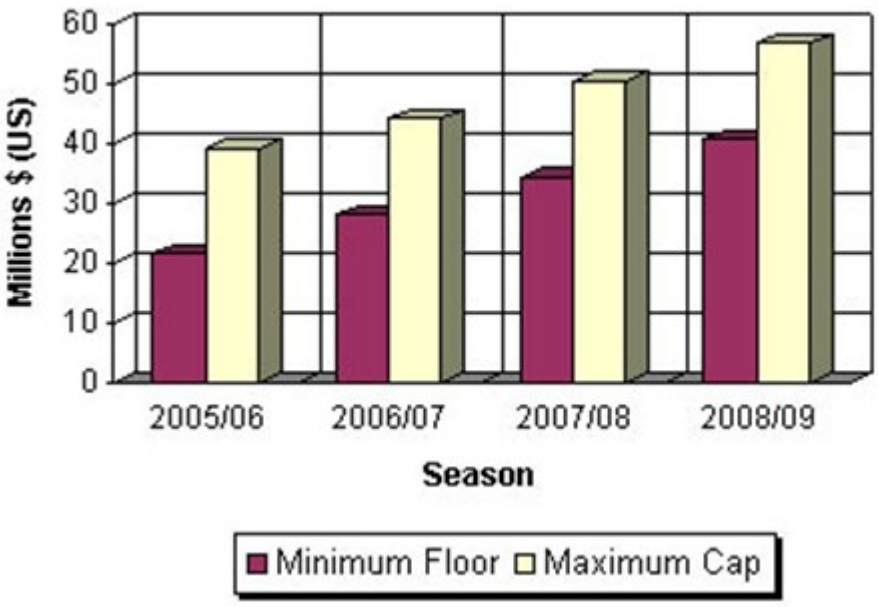
the salary cap would be adjusted each year to guarantee players 54 percent of total NHL revenues, and there would also be a salary floor. Player contracts are also guaranteed. The players' share will increase if revenues rise to specific benchmarks, while revenue sharing will split a pool of money from the 10 highest-grossing teams among the bottom 15. There was a $39 million cap in place for the first year of the CBA.[6] The CBA stands for the Collective Bargaining Agreement.

After the lockout, the salary cap put a limit to how much teams could spend on player salaries. The salary cap is set at a certain percentage of what the league makes a year. So the more the league makes the more a team can spend on their players. The following Chart shows the increase in the National Hockey League salary cap.

[6] Terry Frei. "Roenick's sound-bite puts NHL in the news". ESPN.go.com. http://sports.espn.go.com/nhl/columns/story?columnist=frei_terry&id=2096354

Figure 1.2

NHL Team Salary Floor and Cap



SOURCE: "What's behind the big NHL free-agent salaries?" cbcsports (2011) http://www.cbc.ca/sports/hockey/story/2008/07/04/f-money-nhlfreeagency.html.

As we can see, the salary cap has increased over the years allowing teams to spend more money on players than they have before. However, teams are still stuck with spending only a certain percentage on players. The salary cap helps stop teams from spending all of their money on all-star players. For example, the Chicago Blackhawks had to get rid of many players after they won the Stanley Cup due to player salaries. The Chicago Blackhawks did not have enough money to keep all of their players so they ended up trading players such as Dustin Byfuglein, Chris Versteeg, Ben Eager, Brent Sopel, and Antti Niemi to name a few players that were impact players during their Stanley Cup victory. Now the Blackhawks find themselves in the middle of the conference for the 2010-2011 NHL season. This is an example of the effects of the

salary cap and how it prevents teams from buying as many all-stars as they possibly can. Salary is just one of the independent variables that were touched upon. It is vital to understand the effects the salary cap plays in the National Hockey League since it was instituted in the 2005-2006 season. Each independent variable will be discussed in the paper to come.

The following chapters will display a literature review, which provides logical information regarding past studies that will ultimately help support this study on all stars, and the affect they have on team wins. Following the literature review will be the methodology chapter. This chapter will display quantitative research, which will provide the audience with mathematical models and theories and also come up with relationships between the independent variables. Then the results chapter will discuss how the independent variables and the affect they had on the dependant variable. And finally the conclusion will discuss the outcome as a whole and will enlighten future researchers on possible ways to enhance this study of all stars affects on team wins.

CHAPTER II

LITERATURE REVIEW

Winning is the main goal for every sports team. No team wishes to lose a game when they are playing. The goal when playing sports is to win. Every year teams trade and buy players in an attempt to have the best team in the league no matter which sport is being looked at. So it is no surprise that people are truly interested in what factors can help a team win. In the National Hockey League, there are eighty two games in a single season. Each win is worth two points, a tie is worth one, and a loss is worth zero points. The difference between a win and a loss can end up having a significant impact on how a team finishes in their division after eighty two games. With that being stated, it is extremely important for teams to do everything they can to get those wins.

The focus of this paper is to see if all-star players in the National Hockey League have an effect on their team's wins. In the world of sports, people have an unheralded idea that superstar athletes have a positive effect on their team's winnings. A superstar can be defined as the highest paid player and or the player on a team who is named to the All-star game. One may say that superstar's production deals directly with experience. Gregory A. Krohn's paper deals with measuring the Experience-Productivity Relationship: The Case of Major league Baseball. In his paper, Krohn discovers that over the years, major leaguers becoming better hitters with experience. He provides a direct relationship between experience and productivity. The results

include estimates of the peak of a baseball player's career and the rate at which batting averages change with time.[1] A similar study done by Chad Turner and Jahn Hakes looks at pay, productivity and aging in Major League Baseball. They concluded that the best players on average peak about two years later then marginal players. They also find that development and depreciation of ability appear to be more pronounced for the players with the highest peak ability levels.[2] Some of the other factors that are hypothesized to affect team wins, that will be discussed further in this chapter are; salary, attendance, revenue, and team standings. Figure 2.1 shows the major factors that affect team wins in the National Hockey League.

[1] Gregory A. Krohn, "Measuring the Experience-Productivity Relationship: The Case of Major League Baseball." *Journal of Business & Economic Statistics* 1, no. 4 (1983): 273-279.
[2] Chad Turner, Jahn Hakes, "Pay, productivity and aging in Major League Baseball." *MPRA Paper 4326, University Library of Munich, Germany* (2007).

FIGURE 2.1

FACTORS THAT AFFECT WINS

Table 2.1 summarizes important studies on team wins. The left side of the table shows the section topics that will be discussed. The middle section of the table briefly summarizes the findings and the right side of the table shows the authors that were looked at in the lit review.

TABLE 2.1

SECTION TITLES AND SUMMARY

Section Title	Summary	Authors
Attendance	Attendance is one of the many ways a professional sports team produces revenue. When a team has a superstar caliber player they tend to increase the number of fans that attend the game. People want to see these superstars in action and they may only have one chance a year to see them. So when superstars come to town the away arena is usually filled.	Welki & Zlatoper, (1994), Berri (2004), Brandes (2006), Blackham & Chapman (2004)
Wins/ Team Standing	The number of wins is a reflection on how well a team is doing in a particular season. One can say that the more wins a team has then the better the team standing in the league. Team standing is a rank of each team.	Salzberg (2004)
Revenue	Revenue is the amount of money each team obtains throughout a season. Revenue can be pulled in through attendance, sales of team apparel, television broadcasts, and concessions and parking.	Fenn, Berri (2004), Hausman, Leonard (1997),
Salary	Salary plays a vital role in the production of superstars in the National Hockey League. These players are paid millions of dollars solely on their production level.	Rosen (1981), Mclean & Veall (1992), Kahane (2005) Kahane (2001), Idson & Kahane (2004).

All stars

Around the world of sports all stars are seen as the top players in their league. These players are paid millions of dollars to utilize the skills they were given to perform at a level that is above the average for professional athletes. All stars are more to sports then just what they do on the ice, court, field etc… they carry a persona with them. All-stars have the ability to sell out stadiums, increase a team's revenue and draw popularity to their beloved sport. Kids grow up idolizing their favorite players, which for the most part are all star caliber players. But ultimately it is the all stars that are said to carry the majority of the team and leading them to victory. The following study looks at how all-stars affect a team's winning probability in German soccer.

The purpose of the first study by Rosen and Adler looks to see if talent and/or popularity (otherwise known as all stars) affect the teams winning probability. Rosen and Adler believe that talent and popularity significantly contribute to stars' market values in German soccer. They test their hypothesis by using twenty different performance indicators to estimate a player's talent according to his ability to increase the team's winning probability. Their results show the marginal revenue products of goal scoring and of the saves to shots ratio tend to be overestimated, as they also incorporate the positive aspects of other important performance characteristics that influence winning (Frank, Nuesch, 2007). The large impact of a player's talent on his market demand seems to be justified given the high revenue potential and the significant revenue performance sensitivity in the highest German soccer league. The

next study looks at how the salary cap can help prevent a team from having too many all-stars which prevents them from winning due to money.

Quinn, Geier and Berkovitz paper "Superstars and Journeymen: An Analysis of National Football Team's Allocation of the Salary Cap across Rosters, 2000-2005" revolves around the National Football League and the use of a salary cap. In their paper they discuss how instituting a salary cap has had an effect on superstars as well as journeymen. There were over 10,000 players – season observations that were taken from the 2000 - 2005 seasons. The study shows that a few players account for relatively high portions of teams' caps, and that the players' "cap values" are consistent with both "superstar" and Yule-Simon income distributions.[3] This study is important because it describes how the salary cap has been significantly effective in not allowing teams "spend their way to championships."

It is evident that all-stars are capable of helping a team win games. This is why salary caps were implemented in many sports so that teams who have significant amounts of money cannot spend their way to championships by buying the all of the top players in the sport.

Attendance

Attendance is one of the few ways professional sports teams are able to create revenue for their team. Many professional teams have superstars on their roster. Super stars are athletes who have the ability to excel at their particular sport. Superstars have

[3] Kevin Quinn, Melissa Geier and Anne Berkovitz, "Superstars and Journeymen: An Analysis of National Football Team's Allocation of the Salary Cap across Rosters." *IASE/NAASE Working Paper Series* 7, no. 22 (2007).

a positive affect not only on their team's success but also putting fans in the stands. The following studies look at the impact that all-stars can have on a teams' attendance.

When a fan is rooting for a certain team there is nothing more they want to see then for their team to come out on top and win the game. And for a fan there is nothing more heartbreaking then to spend money on a ticket to attend their team's game and having them loose. In Aju Fenn's paper on Sports Economics he talks about attendance at sporting events and describes the effects of attendance. Sports economists claim that winning is a very important determinant of attendance.[4] When a team is winning fans are going to attend games because winning is utmost what fans want from their teams. The prevailing wisdom about superstar players is that they promote attendance through winning at home and sell out games on the road because everyone wants to see them play.[5] When a superstar goes on the road, they are usually greeted with a sold out arena of fans that want to see them play. Opposing fans only have a few chances a year to see the best players in the National Hockey League play.

Leif Brandes, Egon Franck and Stephan Nuesch agree with the previous journal that star players bring higher attendance ratings. They look at local heroes and Superstars in German soccer. Their believed that star players play an important role in promoting a fans attendance in German soccer. They tested their hypothesis by using longitudinal match attendance data of all clubs in the German soccer league in a 9-year period; the authors analyze star attraction of national super- stars and of so-called local

[4] Andrew M. Welki and Thomas J. Zlatoper, (1994). "U.S. professional football: The demand for game-day attendance in 1991." *Managerial and Decision Economics* 15, no. 5 (2007): 489-495.
[5] David J. Berri, Martin B. Schmidt and Stacey L. Brook, "Stars At the Gate: The Impact of Star Power on NBA Gate Revenues." *Journal of Sports Economics* 5, no. 1 (February 2004): 33-50.

heroes depend as the most valued players of teams with- out national superstars.[6] The paper compares local heroes to superstars of soccer in Germany and how they are portrayed from one another. Superstars attract fans by outstanding field performance, whereas local heroes facilitate fan support by mere popularity. The next study looks at the appeal of attendance of a single superstar in the sport of cricket.

This paper supports the previous two papers of how a superstar or superstar caliber players can affect attendance in sports. Dealing with star attraction turns our attention to the world sport of cricket. The paper written by Julian Blackham and Bruce Chapman deals with Don Bradman, one of the most famous cricket players to ever play the game. This paper examines the value of Don Bradman by estimating an empirical model of the effect of Bradman on cricket match attendances for Ashes Test matches in Australia.[7] They conclude that the attendance effect on days in which Don Bradman batted was over 7,000 additional people each day. This will later be looked at to derive an estimate of the effect on revenue. Don Bradman's superstar appeal, which directly increased attendance tremendously, drew exceeding crowds due to his astonishing batting average. Indeed Bradman's Test batting average of 99.94 is likely to be cricket's best-known single piece of data.[8] The paper used OLS models of test crowd determinants.

---

[6] Leif Brandes, Egon Franck and Stephan Nuesch, "Local Heroes and Superstars
An Empirical Analysis of Star Attraction in German Soccer." *Journal of Sports Economics* 9, no. 3 (June 2008): 266-286.

[7] Julian Blackham and Bruce Chapman, "The Value of Don Bradman: Additional Revenue in Australian Ashes Tests." *CEPR Discussion Papers 480, Centre for Economic Policy Research, Research School of Social Sciences, Australian National University.* (2004).

[8] Julian Blackham and Bruce Chapman, "The Value of Don Bradman: Additional Revenue in Australian Ashes Tests." *CEPR Discussion Papers 480, Centre for Economic Policy Research, Research School of Social Sciences, Australian National University.* (2004).

These papers elaborate on the interest of superstars among the fans and how a superstar athlete can single handedly bring fans to a game whether home or away. In the NHL, player such as Sidney Crosby and Alexander Ovechkin have the effect of selling out arenas due to their stature. With the ability to put fans in the stands, professional sports teams are benefiting from these superstar players because they are creating revenue through the positive outlooks on attendance.

Team Standing

The number of wins is a direct answer to how a given sports team has done in that year. It is pretty simple when determining a team's success by comparing the number of wins from one team to the next. If a team finishes the season with more wins than other teams in the given league then their team standing will ultimately be better as well. The more wins a team has throughout a season then the better the team standing. Ultimately it is every team's goal to finish atop their league.

Rory Salzberg's paper looks at "Team Salary and its Effects on Win Percentage in Major League Baseball." In his work he states, a team's salary has been said to influence its outcome.[9] This means that a team with a large salary in Major League Baseball has the ability to sign superstar players because there is no salary cap in the MLB. Since teams compete for better players by offering higher salaries, how good a team is depends to a large extent on how strong it is financially.[10] Salzberg used a least squares regression with data from the years of 2002 and 2003 in which he ran the

[9] Rory Salzberg (2004), "Team Salary and its Effects on Win Percentage in Major League Baseball." Available online at: http://web.bus.ucf.edu/faculty/rhofler/file.axd?file=2011%2F2%2FSalzberg-Baseball+Team+Salaries+%26+Wins.pdf

[10] Rory Salzberg (2004), "Team Salary and its Effects on Win Percentage in Major League Baseball." Available online at: http://web.bus.ucf.edu/faculty/rhofler/file.axd?file=2011%2F2%2FSalzberg-Baseball+Team+Salaries+%26+Wins.pdf

regressions relating each team's salary to their winning percentage in order to understand the amount or game each team is expected to win that year. Salzberg felt that he did not get the results he set out to achieve in his research which was to have a positive correlation between team salaries and their win percentage.

David J. Berri and Brook did another work were they produced a "Modeling Standing Points in the NHL." They discuss the standings in the National Hockey League. They surveyed data starting from the 1983 season all the way up until the 2007-2008 season. The standing points were regressed on goals for and goals against. This simple regression reveals that each goal scored is worth 0.31 standing points. A goal allowed is worth -0.31 standing points. The model can be found in the work of Berri and Brook (2010) "On the Evaluation of the Most Important Position in Professional Sports."

The studies show that team standings are based directly off of if a team wins. The more that a team wins, the better chances they have of being ranked in the top standings for their division.

Revenue

Revenue can be defined as the money a company or in this case, professional sports teams pull in to help offset their team expenses. Just about all-professional teams pull in revenue through attendance, television broadcasts, and sales of team apparels, concessions and parking. When it comes to televising games not all rules apply. The National Football League has a very unique way of broadcasting their games on national television. The NFL has a blackout rule to prevent reduction in ticket sales… if the game is not sold out 72 hours before kickoff, then it is blacked out in the local

television viewing area.[11] By doing this people in local areas would have to go to the game in order to see it, which also helps create revenue for the team and also the National Football League. The following studies support the idea of how superstar players attract fans to the game, which, ultimately brings in revenue.

A superstar not only plays a vital role on the ice but they also play a vital role off the ice whether they know it or not. If a team cannot bring in any revenue then there are consequences. There is the possibility of a team changing ownership; moving or even folding leaving those teams fans without a professional sports team in a particular sport.

In David Berri's paper "Stars at the Gate," he talks about how star players in the National Basketball Association pull in ticket revenue each and every game. The focus of this article is the affect that two measures of team performance, wins and the star attraction, have on team revenue.[12] To test the results they use a double- logged model and a linear model. The linear model shows that there is no statistical significance when looking at star players, however when looking at the double-logged model it shows that there is statistical evidence. Given the results of the tests, Berri has evidence that there is a relationship between star power and gate revenue. The next article discusses television ratings creating revenue in the National Basketball Association.

This next article by Hausman and Leonard not only aggress with David Berri that superstars can generate revenue but also looks at how superstars can generate revenue for other teams as well. Hausman and Leonard hypothesize that superstar players do not only generate revenue for their team but also generate revenue for

---

[11] Aju Fenn. "Sports Economics."
[12] David J. Berri, Martin B. Schmidt and Stacey L. Brook, "Stars At the Gate: The Impact of Star Power on NBA Gate Revenues." *Journal of Sports Economics* 5, no. 1 (February 2004): 33-50.

opposing teams as well. They also suggested that it is star power, rather than on-court productivity, that attracts the fans.[13] They conclude that superstars not only bring in revenue for their own team but for opposing team's as well. Combining with ticket revenue this paper also offers a look at a second form of revenue, which is television broadcasts. Every weekend main television broadcasters such as ABC, NBC, and ESPN etc… broadcast sporting events. These sporting events aren't going to be teams that don't have superstar players; they are going to be the teams with these superstar players because the fans want to see the best players. Jerry Hausman and Gregory Leonard looked at the National Basketball Association and performed an economic analysis. The economic analysis demonstrates that television ratings for NBA games are substantially higher when certain players ("superstars") are involved.[14]

Ticket revenues are directly related to the previous attendance articles in the sense that superstar players have the effect of drawing fans wherever they play and by drawing fans they are producing ticket revenues for their organization. In the National Hockey League fans have more of an interest in the game when a visiting team has a player with superstar stature. Some teams are privileged to even have more than one superstar, which ultimately draws even more fans. It is evident that the more fans that attend a game for a single team, the more revenue that the team will make.

Salary

The phenomenon of Superstars, wherein relatively small numbers of people earn enormous amounts of money and dominate the activities in which they engage, seems to

[13] David J. Berri, Martin B. Schmidt and Stacey L. Brook, "Stars At The Gate: The Impact of Star Power on NBA Gate Revenues." *Journal of Sports Economics* 5, no. 1 (February 2004): 33-50.
[14] Jerry A Hausman and Gregory K. Leonard, "Superstars in the National Basketball Association: Economic Value and Policy." *Journal of Labor Economics* 15, no. 4 (1997): 586-624.

be increasingly important in the modern world.[15] When people think of superstars they immediately come to the conclusion that these players are making millions of dollars and it is true. Ultimately it is the player's performance that directly affects the player's salaries. When the players perform well, they attract more fans to their game. The increase in fans leads to an increase in revenue, which provides evidence of these superstar players's earning their millions. The following study looks at player salaries in the National Hockey League.

In the paper written by Robert Mclean and Michael Veall, they test to determine if there was discrimination in player's salaries in the National Hockey League between Francophone Canadians and Anglophone Canadians. Their tests concluded that there was little evidence of salary discrimination. Higher point production tends to yield a higher salary and an older player generally gets compensated for his years.[16] Leo H. Kahane did another study along the same lines looking at production efficiency and discrimination in the National Hockey League by using a stochastic frontier approach. The free encyclopedia defines stochastic frontier approach as; a method of economic modeling. It has its starting point in the stochastic production frontier models simultaneously introduced by Aigner, Lovell and Schmidt (1977)[17]. A stochastic frontier approach revealed that production inefficiencies are present in the National Hockey League and they may be linked to various team-level inputs…were coaching ability and other characteristics such as franchise age and whether a team had recently

---

[15] Sherwin Rosen, "The Economics of Superstars." *The American Economic Review* 71, no. 5 (1981): 845-858.
[16] Robert C McLean, and Michael R. Veall, "Performance and Salary Differentials in the National Hockey League." *Canadian Public Policy / Analyse de Politiques* 18, no. 4 (1992): 470-475.
[17]Dennis J. Aigner, C. A. Knox Lovell and Peter Schmidt. "Formulation and estimation of stochastic frontier production functions." *Journal of Econometrics* 6, no. 21-37 (1977).

relocated.[18] Some may say that a player with superstar stature is not doing well due to their coach or to the players surrounding cast such as teammates.

On the other hand, a player's production can have the opposite effect and ultimately increase teammate's production. Superstars tend to have a natural ability to make the player's around him better. This is a major characteristic in determining a superstar in the National Hockey League. In another paper by Leo H. Kahane, he looks at the team and player effects on NHL player salaries using a hierarchical linear model. Empirical results show that there are significant differences in mean salaries and rewards to performance across teams and that these differences can be partially explained by differences in team revenues.[19] If a player continues to meet expectations they can expect to see an increase in salary which ultimately has an effect of the team's salary.

A second paper capturing the idea of just teammate effects on pay done by Todd Idson and Leo Kahane was also done. In the paper they proposed the question "is a players pay affected by the attributes of a teammate?" The frequency of the announcers' phrases, 'Stockton to Malone' in the NBA and 'Gretzky to Kurri' in the NHL…suggest that co-worker attributes do influence an individual's pay and reflect differences in that nature of complementarity in different team, or production environments.[20] They looked at both the National Basketball Association and National Hockey League and found that teammate attributes do influence a teammates pay.

---

[18] Leo H. Kahane, "Production Efficiency and Discriminatory Hiring Practices in the National Hockey League: A Stochastic Frontier Approach." *Review of Industrial Organization, Springer* 27, no. 1 (2005): 47-71.
[19] Leo H. Kahane, "Team and player effects on NHL player salaries: a hierarchical linear model approach." *Applied Economics Letters* 8, no. 9 (2001): 629-632.
[20] Todd Idson and Leo H. Kahane. "Teammate effects on pay." *Applied Economics Letters* 11, no. 12 (2004): 731-733.

When a team has the luxury of having a superstar player on their roster it is not just the fans who become excited. The existing players also become excited because they are given an opportunity to be influenced by the superstar player and can in fact increase production and pay.

Rory Salzberg's paper, "Team Salary and its Effects on Win Percentage in Major League Baseball," which was used in the previous variable under wins/team standings also applies to salary. His study looked at a team's salary in Major League Baseball and wanted to see the effects on teams win percentage. Unfortunately Salzberg did not obtain the results he was looking for and provided with little evidence that higher salaries ultimately lead to a higher win percentage.

David Berri has done recent studies in measuring a player's production of wins for the National Basketball Association. Although this analysis does offer a fair evaluation of how productive a player is, it does not tell us why a player achieves such productivity.[21] However there is a gap in the literature, which lies to see if the theory that Superstars in the National Hockey League affect their teams wins. By using previous studies it would be interesting to be able to test and see if superstars in the National Hockey League have an effect on their teams wins.

Many studies have been done to see if salary affects a team wins. Most players who are considered all-star players are generally paid more than their teammates. In one study, co-worker attributes can also cause line mates to have more pay just for playing with an all-star player. There are still many studies who have come to no conclusion on whether or not salaries affect teams win, but the few studies that do come to conclusions

[21] David J. Berri, "Who Is 'Most Valuable'? Measuring the Player's Production of Wins in the National Basketball Association." *Managerial and Decision Economics* 20, no. 8 (1999): 411-427.

show that increased salary generally means increased all-stars, or better players, which in turn leads to more team wins overall. The next chapter will explain the methodology behind the factors that affect team wins in the National Hockey League.

CHAPTER III

METHODOLOGY

The Purpose of this chapter is to show the methodology that is used to determine if all stars in the National Hockey League have a significant effect on team wins. The type of research done is qualitative research. Quantitative research is scientific research of certain properties and their relationships. The purpose of quantitative research is to use mathematical models and theories and come up with a conclusion about the relationship between variables. This chapter will look at the data set that was used in the regression analysis as well as how the data was obtained. Secondly, this section will also explain the dependant and independent variables that were used in the regression analysis. The data will be taken from all thirty teams in the National Hockey League.

Data Set

In the National hockey League there are thirty teams, which are split into two different conferences. The two conferences that the teams are split up into are the Eastern Conference and the Western Conference. From these two conferences, each conference consists of three divisions. The Eastern Conference consists of divisions such as the Atlantic, Northeast, and Southeast divisions and the Western Conference consists of the Central, Northwest and Pacific divisions. Each conference will supply the same number of all stars to the All-Star Game however the number of all stars from

each division may vary due to the number of all-star players per team. Table 3.1 shows the thirty National Hockey League teams in each conference and division.

TABLE 3.1

TEAMS IN THE NATIONAL HOCKEY LEAGUE

Eastern Conference	**Western Conference**
Atlantic Division	**Central Division**
New Jersey Devils	Chicago Blackhawks
New York Islanders	Columbus Blue Jackets
New York Rangers	Detroit Red Wings
Philadelphia Flyers	Nashville Predators
Pittsburgh Penguins	St. Louis Blues
Northeast Division	**Northwest Division**
Boston Bruins	Calgary Flames
Buffalo Sabers	Colorado avalanche
Montreal Canadians	Edmonton Oilers
Ottawa Senators	Minnesota Wild
Toronto Maple Leafs	Vancouver Canucks
Southeast Division	**Pacific Division**
Atlanta thrashers	Anaheim Ducks
Carolina Hurricanes	Dallas Stars
Florida Panthers	Los Angeles Kings
Tampa Bay Lightning	Phoenix Coyotes

Washington Capitals	San Jose Sharks

Data received from NHL.com[1]

The data required for the regression equation was mainly obtained from NHL.com such as the number of wins a team had per season, and the number of all-stars per team each season. Other data was obtained through ESPN.com such as attendance, and the revenues and salaries for each team were found at rodneyfort.com. The data was collected from the regular season, which excludes playoffs, from the 2000-2001 season to the 2009-2010 season. During the regular season each NHL team plays an eighty-two game schedule (forty- one home and forty-one away games). The purpose of running the regression will be to test to see if the dependant variable and the effects other variables have on it.

Dependant Variable

In this regression, the dependant variable will be team wins from the 2000-2001 season through the 2009-2010 regular season. Team wins is the number of games a team wins throughout the length of a season. In a season in the National Hockey League there are eighty-two games, forty-one home games and forty-one away games. Team wins will be impacted by different variables, which are known as the independent variables.

Independent Variables

In order to test the dependant variable there needs to be independent variables. An independent variable is defined as a variable that determines the value of another

[1] National Hockey League. "Standings." NHL.com Available online at: http://www.nhl.com/ice/standings.htm?navid=NAVlSTNlMain.Internet;accessed September 2010.

variable. In the case of this study the independent variables are taken from all-stars, attendance, salary, team standing and revenue. When looking at previous research, the independent variables are hypothesized to have a form of positive or negative effect on the dependant variable. Below, table 3.2 shows the independent variables and provides a brief description of where the information was obtained.

TABLE 3.2

INDEPENDENT VARIABLE SUMMARY

Variable Name	**Definition**	**Source**
All-Star	A player that was selected to play in the all-star game.	NHL.com
Attendance in Percentage	The amount of seats each teams arena hold for games.	ESPN.com
Salary (million)	The amount of money a team spends on the players.	Rodneyfort.com
Team Standing	The place a team finishes each year comparing all thirty teams	NHL.com
Revenue (million)	The amount of money each team obtains from sales.	Rodneyfort.com

Table 3.3 provides the predicted outcome of the independent variables on wins, which will be further discussed later on in this chapter. In the table below, a positive coefficient means that the independent variable will have a positive effect on wins and a negative coefficient means that the independent variable will have a negative effect on wins.

TABLE 3.3

PREDICTED VALUE OF THE INDEPENDENT VARIABLES

Variable	**Predicted Outcome**
All-Star	+
Attendance in Percentage	+
Salary	+
Team Standing	+
Revenue	+

The sections to come will go into further depth regarding the independent variable and how they are predicted to affect the dependant variable. An in depth definition of the independent variable will be given and will provide with where the information was found.

All-Stars

All stars in the National Hockey League are considered to be the top caliber players because they generally lead the league in offensive categories such as points, goals, assists and saves. An all star is defined as a player who has participated in the all-star game. In today's game a few examples of all stars would be players such as Alexander Ovechkin of the Washington Capitals and Sidney Crosby of the Pittsburgh Penguins. These two players have lead the league in points over the last few seasons

and have won league awards for top scorer and league most valuable player and have been named to the all star game over the past few years. The data for all stars were found at NHL.com were they provide a roster for the All-Star game each and every year. When looking at previous research done in chapter two, all stars have this unheralded ability to fill arena's do to their stardom. As a young boy growing up in New York it was hard to see a player such as Wayne Gretzky who played across the country for the Los Angeles Kings. When Gretzky and the Kings came to town my father bought tickets at ice level so we could see "The Great One" himself perform. These players attract fans to games because fans want to see the top caliber players perform whether they are on the home team or the away team. Fans enjoy watching all-star players mainly because of their skill levels. All-star players tend to have the ability to do things with the puck that not all players are able to accomplish. When I player is able to skate through players and utilize his stick skills it is known as dangling. Dangling is someone with awesome stick handling ability.[2] The more these all star caliber players can utilize their top end skill to create offense and produce scoring chances and ultimately produce goals then the more they can help their team be successful and win games.

Attendance

Attendance can be defined as the number of seats that a hockey arena holds for each game. Each team will play forty-one home games and forty-one away games per season. The data for attendance was obtained from ESPN.com. Every arena holds a

[2] "Hockey Terms." Street Hockey King. Available from http://www.streethockeyking.com/hockeyterms.html. Internet; accessed 9 January 2011.

different number of seats so attendance will have to be calculated as a percentage. By calculating attendance by a percentage, each rink will be held equal in the sense of how the data was manipulated. For example, Nassau Veterans Memorial Coliseum, home of the New York Islanders is an older facility that only holds sixteen thousand fans. On the other hand the Los Angeles Kings play at the Staples Center which hold eighteen thousands plus. If the data was not manipulated into a percentage then the teams with smaller arenas will be at a disadvantage and the results of the data would not be held on a constant level. All stars are a big factor when it comes to attendance. Fans want to see all star players perform at high levels. Not only do fans want to be dazzled by high-end skill but they also want to see teams produce goals. Past research has shown that the more goals that are scored in a game/season, the more fans a team will have at their games.[3] All stars and attendance can be seen as having a positive effect on one another.

Salary

A salary can be defined as the amount of money someone earns through the work they do. When looking at the National Hockey League player salaries come to mind. There is a twist involved with salaries because prior to the 2004-2005 lockout, where there was no National Hockey League season, there was no salary cap. There was no salary cap meaning teams could spend as much as they wanted on salaries. A salary cap is a limit on the amount of money a team can spend on its players. A salary cap was instituted in order to create more competitive balance around the national hockey league. The salary cap also gave teams, who may have had lower revenue, the

[3] Paul J Rodney, "Variation in NHL Attendance: The Impact of Violence, Scoring and Regional rivalries-discrimination and the NHL." *The American Journal for Economics and Sociology*, (2003):

ability to vide for all star caliber players. This also stopped teams with high revenue the chance to buy out all the players that smaller revenue teams could not afford. Since the 2004-2005 National Hockey League lockout, a salary cap has been implemented. Research done through this work has provided an example of how the National Hockey League has increased the nature of competitive balance. Prior to the lockout not all teams were able to supply a single player to the All-Star Game. There were some teams that would send three to four players while other teams would not send a single player. Since the post lockout era, every team from the National Hockey League has been able to supply at least one player to the All-Star Game. This has been made possible through the use of a salary cap, which has ultimately been a positive effect on the game of hockey and for the National Hockey League.

Team Standing

Team standing can be defined as what place each team finishes each year. There are thirty teams in the National Hockey League so at the end of each season teams are organized from one to thirty (one being the best and thirty being the worst). The team with the most points will finish first and the team with the least amount of points finishing last and the rest of the teams are filled in between. If teams have the same amount of points, the tiebreaker goes to the team with more wins, and then to a head to head matchup. This data was found at NHL.com for every season.

Revenue

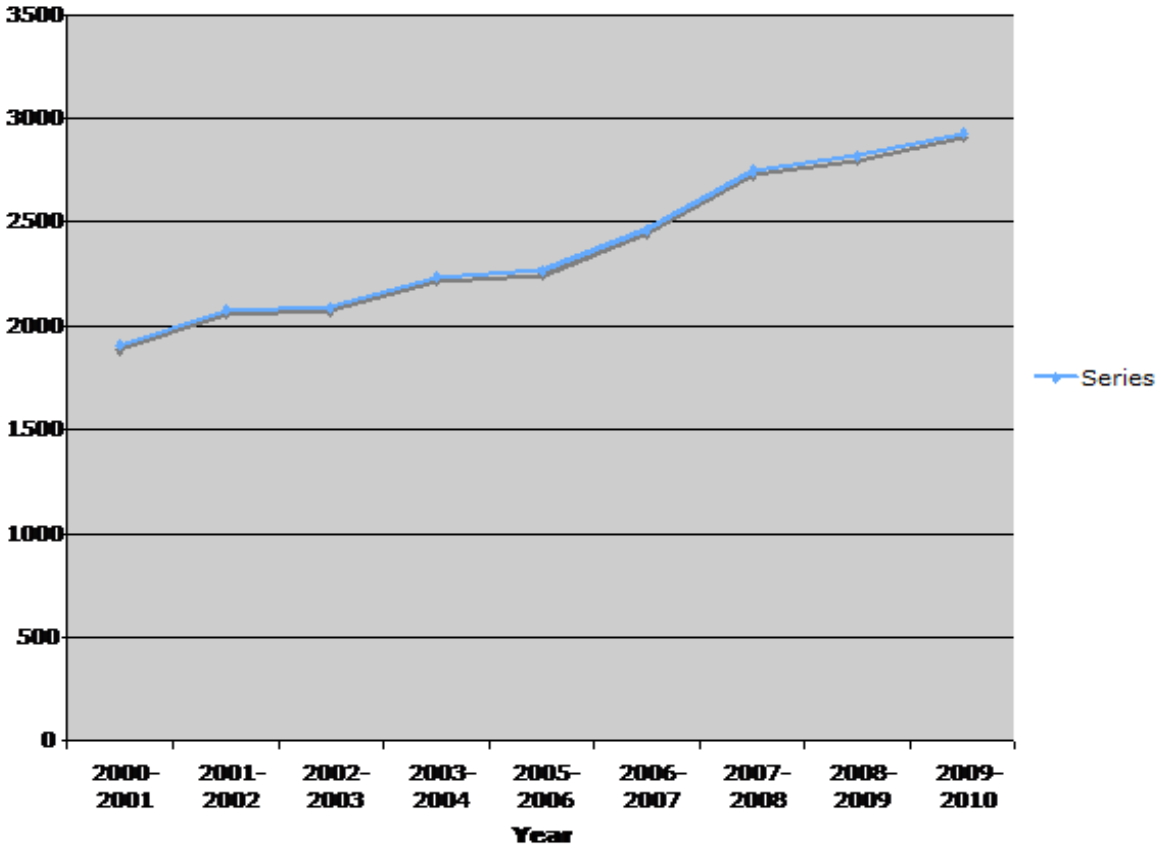
When running a company, revenue is extremely important especially in the National Hockey League. Revenue is the income a company receives from sales. In the

case of the National Hockey League sales such as tickets, concessions, team merchandise etc… Revenue plays such a vital role because the money, which is made from sales ultimately, goes to the team and can be used towards player's salaries. A team that has higher revenue can spend more money on their players. Due to the salary cap in the National Hockey League, it is based on a percentage of revenue. So if revenue continually increases over the years then the salary cap will be able to increase as well. This will provide teams the ability to pay more for certain players, in the case of all stars. Chart 3.1 provides a visual of how over the years the revenues in the National Hockey League have increased. As one can see, since the 2000-2001 season all the way through the 2009-2010 season, the National Hockey League has seen a tremendous increase in revenue. Gary Bettman, the commissioner of the National Hockey League has been done a tremendous job trying to increase the popularity of hockey as well as produce revenue for the league. In January of 2011, Commissioner Gary Bettman was quoted saying "In a very difficult economic environment, we continue to hold our own," Bettman told the San Jose Mercury News on Sunday night. "The projections are that revenue will be up 4 or 5 percent."[4] The chart below provides evidence of Bettman's quote as the revenues in the National Hockey League over the past ten years are explored.

[4] "Gary Bettman: NHL revenue on upswing." NorthJersey.com. Available online at: http://www.northjersey.com/sports/pro_sports/hockey/other_nhl_news/113258904_Bettman__Revenue_on_the_upswing.html

FIGURE 3.1

REVENUES IN THE NATIONAL HOCKEY LEAGUE



An empirical model was instituted with the help of previous studies to test the hypothesis. The hypothesis being tested is that a win in the National Hockey League has been positively affected by having an all star caliber player on a team. The independent variables, which are listed previously in this chapter, are the variables believed to have a significant impact on all stars affect on team wins in the National Hockey League. Below, model 3.1 is the empirical model used to test the affects of all stars on team wins in the National Hockey League.

MODEL 3.1

Wins = Bo + B1 Allstar + B2 Attendance + B3 Salary + B4 Revenue + B5 Team Standing

This chapter provided a descriptive analysis of the dependant and independent variables that are to be tested. Also provided was a full analysis of the data set. To come in the next chapter, model 3.1 will be put to test to see which independent variables will have a positive effect, with values of significance, on wins. The next chapter will also discuss the outcome of the regression analysis in order to enlighten the significance of the independent variables.

CHAPTER IV

RESULTS

In this chapter the variables described in the previous chapter will be discussed in more detail. The data that was collected has been analyzed by using wins as the dependant variable. As you look at model 4.1, it provides the Wins equation, which was tested against numerous independent variables. These independent variables were utilized due to the belief of their significant impact on wins in the National Hockey League. Table 4.1 provides a summary statistics of the variables while Table 4.2 provides the regression results and the level of significance for each independent variable.

Below, Model 4.1 is the final equation used for the regression. In this regression model there are four variables that were tested against wins. One variable was removed from the regression equation. Some of the variables in the model are subtracted while some of the variables in the model will be added in the equation. This is directly related to how the variables affect wins. The added variables indicate that these variables had a positive influence on wins while the negative variables indicate that these variables had a negative influence on wins. Standings have been eliminated from the equation because the variable was directly correlated to wins. Standings are directly correlated to the amount of wins because wins helps the league determine what place the team finishes, which is also known as standing.

MODEL 4.1

Wins = Bo + B1 All stars + B2 Salary - B3 Revenue + B4 Attendance

Summary Statistics

Table 4.1 will display the following: the mean, standard deviation, minimum values, and maximum values for each variable. These variables will be the ones that were utilized in the final model above. Before jumping to table 4.1, this chapter will look and define the methods that were used to test the mean, standard deviation, minimum values, and maximum values.

The first test looked at is the mean. This formaula is more academically known as the arithmic mean. The arithmic mean is a set of values that are commonly call the "mean" or the "average". Here is the arithmic mean formula:

$$\overline{x} \equiv \frac{1}{N} \sum_{i=1}^{N} x_i .$$ [1]

The type of Standard deviation being applied is known as the population standard deviation. The populaton standard deviations does exactly what is sounds like. The population standard deviations measures the variablilty of data in a population. The formula for population standard deviation is:

---

[1] Weisstein, Eric W. "Arithmetic Mean." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/ArithmeticMean.html

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(X_i - \mu)^2}$$ [2]

A minimum value is the lowest number for each variable while the maximum value is the greatest number for each variable. Below, Table 4.1 will provide a summary of the statistics.

[2] Weisstein, Eric W. "Standard Deviation." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/StandardDeviation.html

TABLE 4.1

SUMMARY STATISTICS

Variable	Mean	Standard Deviation	Minimum	Maximum
Team Wins	38.67407	8.16223	19	58
All –stars	0.966418	1.006901	0	111.2
Standings	15.4963	8.665939	1	30
Salary (Million)	42.73481	13.10413	11.7	77.9
Revenue (Million)	79.66296	23.44878	39	187
Attendance (Percentage	91.45481	9.854935	62.1	5

The next table, Table 4.2 will provide the regression results for each variable that was tested. It is important to note that in this table, the number provided will be the coefficient. Under the coefficient in parenthesis will be the standard error. The standard error of a sample of sample size n is the sample's standard deviation divided by $\sqrt{n}$.[3]

[3] Weisstein, Eric W. "Standard Error." From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/StandardError.html

TABLE 4.2

REGRESSION ANALYSIS

(STANDAED ERROR IN PARENTHESIS)

Variables	**Equation**
All- star	1.23615 (.433)
Salary (Million)	.1885845 (.0425)
Revenue (Million)	-.0078135 (.0254
Attendance (Percentage)	.2349601 (.0522)

** Significance at the 99% confidence level (t-stat > 2.576)*

*** Significance at 95% confidence level (t-stat >1.96)*

**** Significance at 90 % confidence level (t-stat > 1.653)*

The data set for the regression included 270 observations, which covered over the time period of the 2000 through the 2011 hockey seasons in the National Hockey League. In the next section, the variables and coefficients in model 4.1 will be analyzed in more depth.

Model 4.1 shows the regression equation as well as the affect that the independent have on team wins. In the regression there are three independent variables that are statistically significant. The three independent variables that are statistically significant are all-stars, attendance, and salary. Each of these statistics is significant at the 99% confidence level, which is any t-statistic greater than 2.576.

The purpose of this study is to see if all stars in the National Hockey League have a positive effect on team wins. Through the regression analysis and the t statistic of 2.86, all stars are significant at the 99% confidence level. Without all stars being significant this study would not have been worthwhile. All stars play a vital role as they provide exciting plays and demonstrate extraordinary skill. These players are heralded, as there is only a handful of all star caliber players in the National Hockey League. The beauty of these players is that there will never be a drought of all-stars because there is constantly new talent and up and coming all star caliber players being drafted by NHL teams each year. For example, as Mario Lemieux was in his final seasons in the National Hockey League young Sidney Crosby was drafted by the Pittsburgh Penguins. Today, Sidney Crosby is one of the top players in the National Hockey League.

Attendance was expected to have a positive effect on team wins. The t-statistic for attendance is 4.50, which makes it statistically significant at the 99% confidence level. Attendance had the highest t-statistic out of all of the independent variables. When arenas are completely sold out, the t-statistic shows that teams win more games. A sold out arena has a way of energizing a home team and ultimately being the seventh player on the ice.

Salary was seen as being positive due to the insertion of the salary cap after the 2004-2005 season ending lockout. Before the lockout, not every had an all-star. After the lockout, every team had at least one all-star on their team. Salary had a t-statistic of 4.43, which makes it significant at the 99% confidence level. With the salary cap being instituted it has created an increase in competitive balance throughout the National Hockey League. The salary cap puts a limit on how much money each team can pay their players. Teams have to be aware of their available cap space when dealing with all-star players. Since teams can no longer buy whoever they want, competitive balance in the National Hockey League has become closer to fifty percent which means that the competition is closer and there are no single teams winning every game.

The remaining independent variable, Revenue, was expected to have a significant impact on team wins since the more revenue a team has the more money an owner could put into the team disregarding salary. The t-stat for revenue is -0.31 that causes revenue to have a negative effect on team wins. It was thought that teams with higher revenue have an advantage over teams with low revenues. Advantages can be such as state of the art electronically equipment to help players study their own game and improve it. Coaches will also benefit from this as they can use this equipment as teaching tools. Also along the lines of state of the art would be medical equipment to help provide an injured player the ability of getting back on the ice sooner. It turns out that revenue does not play a vital role in team wins when looking at the t-statistic.

This studies focus point looks at what factors affect team wins with the full emphasis on all-stars in the National Hockey League. When looking at the results of the regression analysis, the r-squared is only 0.28 which means that only 28 percent of

the factors affecting a team win with the emphasis of all-stars is covered. The r-squared informs us that there are more factors that might have an impact on all-stars effect on team wins. Since the focus of this study was to see if all-stars have a positive effect on team wins then one can assume that there can be outside factors that affect team wins. There can also be game other game factors that might affect how much a team wins. A few examples of game factors that may affect teams win are; points and penalty minutes. The next chapter will sum up the study with final conclusions and a look into what further research can be done to establish more factors that affect team wins with an emphasis on all-stars.

CHAPTER V

CONCLUSION

This final chapter will present the final conclusion of this study and will also provide discussion on future research that can be done to provide this study with the utmost potential. The study tested five independent variables in the attempt of determining what factors have a significant effect on team wins with an emphasis on all-stars. The study looked back on the past ten seasons in the National Hockey League, from the 2000-2001 season up until the 2009-2010 season. The variables that were originally utilized and tested were as follows: team wins, all-stars, standings, salary (million), revenue (million), and attendance (percentage). Upon further study it was brought to attention that standings and team wins have a direct comparison so that standings was taken out of the final equation. All of these variables were projected positive that all stars would have a positive effect on team wins. However, revenue was determined to be negative, leaving only three variables to have a positive significant affect of all stars on team wins. Revenue was originally projected to have a positive impact because one would think that the more money a team has then the more money they can pay their players, ultimately being able to buy all star caliber players. But when looking at revenue it makes sense that it is negative due to the implementation of the salary cap which was created during the lockout of the 2004-20065 season.

Conclusion

When researching this study it was brought to attention that there have not been many if not any studies touching upon the topic of all stars and their affect on team wins in the National Hockey League. This study provides people with an insight on what factors affect how all stars in the National Hockey League and how all stars affect team wins. More research will need to be done in order to determine every possible factor that affects team wins with an influence on all stars in the National Hockey League. Through the research of this study it is concluded that out of the four independent variables, three of the variables had a significant affect pertaining to all stars and their affect on team wins on a significant level. The three variables are all stars, salary, and attendance.

All stars were found to be significant at 95% significance level. This proves once and for all that having all stars on your team is an advantage and helps teams produce wins which in any sporting event is what every wants to see if their team win. Without all stars in the game today it would be hard for the National Hockey League to progress as well as it has over the past few years. All stars continue to attract fans to games no matter if they are playing at home or even on the road. Fans always enjoy seeing the best caliber players; it is a treat for the fans. Now that the game has changed since the rule changes were implanted due to the lockout in 2004-2005, there is more chance for these all stars to utilize their immense amounts of talent they portray and dazzle the fans of the NHL today.

The second variable is salary, which is also significant at the 95% significance level. Salary is interesting because each team has a cap that is instilled by the league

every year. Teams must obey the salary cap or else they are penalized if they exceed the set limit. Teams may choose to keep salary space this way they can perform trades and obtain players with higher salaries. Again this salary cap was one of the main reasons why there was a lockout for the 2004-2005 season. Now that each team has a salary cap, teams cannot stack their teams with all-star players just because they have more money than other organizations in the National Hockey League.

The last variable that had significance is attendance at the 95% significance level. Attendance plays a valuable role in the outcome of wins as well as all stars participating in games. All stars ultimately are the ones who draw fans to the games and it has been proven that all stars tend to bring fans to games. This study provides evidence that attendance helps teams win games. A sold out arena gives the home team an advantage because players tend to feed off of the crowd. Teams with a high attendance percentage tend to be more successful in the NHL.

This study looks at factors that affect team win in the National Hockey League with an emphasis on all stars. The r-squared was 28%, which means that there are missing factors in the equation that was used in this equation. Meaning that the equation in this study is not the most accurate when looking at all stars affect on team wins. The rest of this section will turn its attention towards further determinants on what affects all stars on team wins in the NHL.

This study looked at factors such as all stars, attendance, salary, revenue and standing. All of these factors deal with all stars outside the actual game of hockey. In furthering this study one may want to look into the in game statistics that all stars produce. In- game statistics will advance this study because ultimately the game

statistics show the point production of these high end players. Statistics such as goals scored and assists which ultimately lead to point production. The more goals and assists you're all star player or players have then it is more likely your team will end up on the winning side of games. Other in game statistics pertaining to players that might want to be taken into account, which may also have an effect, may be looking at a player plus minus, how many shots they take, penalty minutes, time on ice etc… These factors may play an important role in researching a more complete and accurate view of all stars affect on wins in the National Hockey League. This study provides insight on all stars and their affect on team wins through outside game factors but fails to look at the in game factors that affect an all stars affect on team wins. These information paths the way for further research on what factors have an effect on team wins with an emphasis on all stars in the National Hockey League.

WORKS CONSULTED

Aigner, Dennis J., C. A. Knox Lovell and Peter Schmidt. “Formulation and estimation of stochastic frontier production functions." *Journal of Econometrics* 6, no. 21-37 (1977).

“All-star.” Merriam- Webster Online Dictionary. 2011. Merriam Webster Online. January 10 2011 < http://www.merriam-webster.com/dictionary/all-star>

Article 11, Section 11.17, "Currency". *Collective Bargaining Agreement between the National Hockey League and the National Hockey League Players' Association*. July 22, 2005.

Berri, David J. "Who Is 'Most Valuable'? Measuring the Player's Production of Wins in the National Basketball Association." *Managerial and Decision Economics* 20, no. 8 (1999): 411-427.

Berri, David J, Martin B. Schmidt and Stacey L. Brook. “Stars At The Gate: The Impact of Star Power on NBA Gate Revenues." *Journal of Sports Economics* 5, no. 1 (February 2004): 33-50.

Blackham, Julian and Bruce Chapman. “The Value of Don Bradman: Additional Revenue in Australian Ashes Tests." *CEPR Discussion Papers 480, Centre for Economic Policy Research, Research School of Social Sciences, Australian National University.* (2004).

Brandes, Leif & Egon Franck & Stephan Nuesch. "Local Heroes and Superstars an Empirical Analysis of Star Attraction in German Soccer." *Journal of Sports Economics* 9, no. 3 (June 2008): 266-286.

Cbcsports. “What's behind the big NHL free-agent salaries? Available online at: http://www.cbc.ca/sports/hockey/story/2008/07/04/f-money-nhlfreeagency.html

Diamond, Dan (1991). *The Official National Hockey League 75th Anniversary Commemorative Book*. Toronto: McClelland & Stewart, 1991.

ESPN.go.com. “NHL attendance report.” Available online at: http://espn.go.com/nhl/attendance

Fenn, Aju. “Sports Economics.” *Working Paper,* Colorado College (2010).

Fitzpatrick, James. “Why didn’t the NHL do something about spiraling salaries before?” About.com. Available online at: http://proicehockey.about.com/od/collectivebargainingfaq/f/origins.htm

Frei, Terry. “Roenick’s sound-bite puts NHL in the news”. ESPN.go.com. Available online at: http://sports.espn.go.com/nhl/columns/story?columnist=frei_terry&id=2096354

Hausman, Jerry A., and Gregory K. Leonard. "Superstars in the National Basketball Association: Economic Value and Policy." *Journal of Labor Economics* 15, no. 4 (1997): 586-624.

Heyne, John Jerald. *NHL team production.*2006. By John Jerald Heyne; ill. ; 29 cm; Department of Economics; Senior Thesis -- Colorado College; Bibliography: p. 77-81.

Idson, Todd and Leo H. Kahane. "Teammate effects on pay." *Applied Economics Letters* 11, no. 12 (2004): 731-733.

"Journal of sports economics." (2000)263: 0002; v.: ill. ; 23 cm; Quarterly; Vol. 1, no. 1 (Feb. 2000).

Kahane, Leo H. " Production Efficiency and Discriminatory Hiring Practices in the National Hockey League: A Stochastic Frontier Approach." *Review of Industrial Organization, Springer* 27, no. 1 (2005): 47-71.

Kahane, Leo H. "Team and player effects on NHL player salaries: a hierarchical linear model approach." *Applied Economics Letters* 8, no. 9 (2001): 629-632.

Krohn, Gregory A. "Measuring the Experience-Productivity Relationship: The Case of Major League Baseball." *Journal of Business & Economic Statistics* 1, no. 4 (1983): 273-279.

McLean, Robert C., and Michael R. Veall. "Performance and Salary Differentials in the National Hockey League." *Canadian Public Policy / Analyse de Politiques* 18, no. 4 (1992): 470-475.

Moran, Edward. “It Was A Great Send-Off.” Philly.com. Available online at: http://articles.philly.com/1999-04-19/sports/25519696_1_great-one-professional-hockey-friend-today/2

National Hockey League. “Standings.” NHL.com Available online at: http://www.nhl.com/ice/standings.htm?navid=NAVlSTNlMain.Internet;accessed September 2010

NorthJersey.com. “Gary Bettman: NHL revenue on upswing.” Available online at: http://www.northjersey.com/sports/pro_sports/hockey/other_nhl_news/113258904_Bettman__Revenue_on_the_upswing.html

Paul, J. Rodney. "Variation in NHL Attendance: The Impact of Violence, Scoring and Regional rivalries-discrimination and the NHL." *The American Journal for Economics and Sociology*

Quinn, Kevin, Melissa Geier and Anne Berkovitz. "Superstars and Journeymen: An Analysis of National Football Team’s Allocation of the Salary Cap across Rosters." *IASE/NAASE Working Paper Series* 7, no. 22 (2007).

Rosen, Sherwin. "The Economics of Superstars." *The American Economic Review* 71, no. 5 (1981): 845-858.

Salzberg, Rory (2004). “Team Salary and its Effects on Win Percentage in Major League Baseball.” Available online at: http://web.bus.ucf.edu/faculty/rhofler/file.axd?file=2011%2F2%2FSalzberg-Baseball+Team+Salaries+%26+Wins.pdf

Street Hockey King. "Hockey Terms."Available online at: http://www.streethockeyking.com/hockeyterms.html. Internet; accessed 9 January 2011.

Turner, Chad and Hakes, Jahn. “Pay, productivity and aging in Major League Baseball." *MPRA Paper 4326, University Library of Munich, Germany* (2007)

Weisstein, Eric W. "Arithmetic Mean." From *MathWorld*--A Wolfram Web Resource. Available online at: http://mathworld.wolfram.com/ArithmeticMean.html

Weisstein, Eric W. "Standard Deviation." From *MathWorld*--A Wolfram Web Resource. Available online at: http://mathworld.wolfram.com/StandardDeviation.html

Weisstein, Eric W. "Standard Error." From Math World--A Wolfram Web Resource. Available online at: http://mathworld.wolfram.com/StandardError.html

Welki, A.M. and Zlatoper, T.J. " U.S. professional football: The demand for game-day attendance in 1991." *Managerial and Decision Economics* 15, no. 5 (2007): 489-495.