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Slugger or Slacker: A Sabermetric Assessment of Free Agency on Major League Baseball Player Performance

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SLUGGER OR SLACKER: A SABERMETRIC ASSESSMENT OF FREE AGENCY ON MAJOR LEAGUE BASEBALL PLAYER PERFORMANCE

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This work is dedicated to my beautiful wife, Wanda. Your unfailing love, generous support and constant encouragement carried me through. I am truly blessed.

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ABSTRACT

This study analyzed Major League Baseball player performance using sabermetric measurements of offensive productivity in order to determine how player production was impacted as a result of free agency. The theoretical framework for this research is based on two competing theories of social and organizational behavior: J. S. Adams' Equity Theory and Victor Vroom's Expectancy Theory. Both equity theory and expectancy theory were developed to predict worker performance under conditions of inequity in terms of under-reward and over-reward. In conjunction with both theories, this study assumed the following: (1) that players in the final year of their contracts, just prior to becoming eligible for free agency, perceived inequitable conditions of under-reward, and (2) that players who signed a new multi-year free agent contract perceived inequitable conditions of over-reward in the first year of a new contract.

Sabermetric measurements, OPS, Runs Created, and Win Shares, were utilized to assess performance improvements or decrements for players in each of the following three years: (1) pre-option year- the year prior to a player becoming a free agent, (2) option year- the last year of a player's contract, and (3) post-option year- the first year of a player's new contract. Subjects consisted of Major League Baseball free-agents who signed multi-year contracts of at least two years or more with a their current team or another major league franchise between the years of 1976 and 2003 (n = 234). In order to qualify for inclusion, players must have had a minimum of 250 at-bats in each of the three individual years being examined: pre-option year, option year, and post-option year. Covariates, age and team winning percentage, were incorporated into this study in an attempt to control for specific factors thought to impact individual player performance.

Results of multivariate analyses of variance (MANOVA) revealed that free agency had a significant impact on each of the three performance measures. Follow-up univariate analyses of variance (ANOVA) indicated that player performance significantly declined for each of the dependent variables following free agency. When controlling for age, multivariate analyses of covariance (MANCOVA) revealed no significant effects with regards to the impact of free agency on player performance. When controlling for team winning percentage, however, multivariate and univariate analyses indicated that

post-option year team winning percentage significantly affected the impact of free agency on player productivity. For each of the dependent variables, significant findings were consistent with expectancy theory predictions.

CHAPTER I

INTRODUCTION

Accurate assessment of employee performance and productivity is an invaluable part of understanding, predicting, and influencing organizational success. Likewise, evaluation of worker development in terms of skill, ability, and accomplishments is essential in determining an individual's value to a company and its components. The knowledge and insight gained from these assessments allows organizations to become more efficient and ultimately more effective. In today's business world, many companies rely on employee performance assessments to determine salaries and rewards for their workers.

Bishop (1987) noted that adjusting salaries to reflect productivity produces three kinds of benefits for an organization. First, it serves as an incentive for greater effort from the employee. Second, it tends to attract more productive workers who like to work hard. Third, it reduces the probability of losing the best performers to other companies and raises the probability that the least productive workers will leave.

In most cases, however, performance cannot be measured objectively because there is no universal standard. What one employer may value and consider productive, another employer may regard as insufficient and lacking. According to Alchain and Demsetz (1962), this problem is a fundamental contributor to an organization's inability to accurately measure employee productivity, especially in regards to long-term labor contracts. Many organizations are left trying to answer the same age old questions: Is employee "A" as productive as in years past? How does employee "A" compare to employee "B"? Could I replace employee "A's" production value with employee "C" at a lower cost to the organization?

These questions and others like them continue to present many organizations with legitimate challenges in their attempts to assess employee performance and determine how it translates into value for their company. According to Pinder (1984), employee performance is often difficult to ascertain and predict due in large part to the subjective evaluations used to measure performance. While Pinder's assertion is accurate for numerous organizations throughout many industries, it does not hold true for work environments where performance is not measured subjectively, such as professional sports, in particular, professional baseball. Professional baseball, as an industry, is unique in that workers (players) can be evaluated by the same impartial performance standards. These objectively measured standards are easily quantifiable and are capable of being compared interchangeably with those of past generations.

Methods of evaluation in baseball rely on statistical measures of individual and team performance. The standard for most measurements in baseball is perfection. Nearly every percentage statistic in baseball is a number signifying a proximity to perfection.

The use of statistics in baseball, and sports for that matter, is not a new concept. As the game of baseball has evolved, however, so has the complexity of its statistical measures. Likewise, the way that players are evaluated and statistics are analyzed has changed dramatically during the past half century. Over time, more accurate, detailed, descriptive and efficient ways to measure talent, performance, and productivity have been developed. Specifically, in the last twenty five years objective measurements called sabermetrics have redefined statistical analysis and generated a buzz throughout the baseball world (Berardino, 2003).

Sabermetrics

According to Craig Wright (1985), author, researcher, and self described "baseball-ologist" who has spent the last 20 years with major league baseball teams introducing science-based knowledge into their evaluations of player talent, sabermetrics is defined as "the scientific research of the available evidence to identify, study, and measure forces in professional baseball"(p. 1). The term, created by Bill James, is derived from the acronym SABR, which stands for the *Society for American Baseball Research* (James, 1982). James is considered by many to be the "Father of sabermetrics" due in large part to his published writings on the subject and his development of some of the more widely recognized "metrics" associated with this area of study.

The idea behind sabermetrics is to find a way to objectively analyze every aspect of the game. Using sabermetrics means relying on probabilities and scientific standards instead of the naked eye, no matter how much that eye has seen before (Quinn, 2003).

Sabermetrics offers more comprehensive and complete assessments of performance than traditional measures.

These "new" statistical metrics and their utilization have become an integral part of professional baseball. Throughout the game, sabermetrics is used to develop strategy and assess team strengths and weaknesses. Yet, sabermetrics is primarily concerned with determining players' past and present values and predicting their future performance. Thus, sabermetrics is often used by teams and agents alike to evaluate a player's performance in relation to other players for the purposes of negotiating contracts.

According to Frank Coonelly, Major League Baseball's senior vice president for labor relations, sabermetrics has become the language of salary arbitration and salary negotiation. Coonelly said:

> "There used to be the argument that (the classic statistics) were the only official evidence. The union felt the clubs had better access to the 'exotic' statistics than they did. All of that went by the wayside, probably 10 years ago or less, when STATS, Inc. came out with their handbook. Immediately, everybody in the arbitration room would have the handbook" (Quinn, 2003).

Incidentally, STATS, Inc. was created by Bill James and his cohorts, John Dewan and Dick Cramer in 1988, in an effort to establish a pitch-by-pitch, play-by-play database for every game played during the season. It has since evolved into a mainstay of professional baseball relied on by the media and a number of front offices throughout baseball.

Professional baseball as an industry mirrors many organizations in today's business world in terms of its need to objectively evaluate the performance of its workers (players). Baseball relies on these evaluations in order to establish essential aspects of the game such as strategizing, scouting talent, drafting amateur players, negotiating, signing/resigning free-agents, calling-up minor leaguers, trading players, and releasing players. In addition, owners and team executives are constantly trying to answer the same fundamental questions: Are we getting the production we are paying for? Does player performance decline with increased job security? To what extent does money motivate players? What is a player's replacement value?

The definition of success for a baseball general manager is to be able to accurately answer the preceding questions. As a result, much research and painstaking effort has gone into finding the best approach to objectively analyze the game and address problems associated within the industry. One such area of concern, particularly for baseball owners is the notion of performance decline commonly associated with player free agency.

Free Agency

Free agency and performance in professional baseball are relevant topics given the current state of the industry. Over the last thirty years, Major League Baseball's labor market has experienced significant changes that are affecting teams both on and off-the-field. Since the inception of free agency in 1976, owners have been offering players guaranteed multiyear contracts. Prior to 1976, during the reserve era, virtually all major league players had single-season non-guaranteed contracts (Lehn, 1982). As a result of free agency, eligible players are no longer doomed to spend their playing days at the mercy of team owners. Tenured players are now rewarded with financial and job security (Kahn, 1993).

Free agency has altered the landscape of baseball indefinitely. For the majority of professional baseball's existence, the balance of negotiating power between players and teams favored ownership (Zimbalist, 1992b). By stopping the restriction of player mobility, free agency drastically changed baseball's labor market in terms of contract negotiations and competitive balance. Free agency ensured that teams were no longer just competing against each other on the playing field but also in contract negotiations with prospective players. This new form of market structure opened the door to bidding wars and guaranteed multiyear contracts. It has also shaped the current economic and organizational trends that trouble owners today. For example, in order for teams to attract and sign players, owners must be willing to offer security in the form of guaranteed long-term contracts. If one team does not, most assuredly, other teams will (Scully, 1989).

Statement of the Problem

In professional baseball, the performance of a player varies from game to game and from season to season. Due to this randomness of productivity, it is impossible to absolutely know the value of a player's inputs relative to his outcomes. Rather, a player's productivity must be estimated from reliable measurements used to determine his expected contributions (Krautmann, 1990). In addition, since past performance is the primary tool used to assess future productivity, it is imperative for evaluators to understand why players performed better or worse in certain years and what factors contributed to their improvement or decline in production. This particular study focused on one specific factor commonly associated with player improvement and decline, free agency.

Given the current landscape of baseball's labor market, it is especially important for team owners and executives to be able to determine, with some degree of certainty, a player's performance value. With skyrocketing player salaries and the ever-diminishing realization of competitive balance, the success of an organization hinges on its ability to make correct personnel decisions in terms signing and resigning players.

Once decisions are made to sign free agents, the question then becomes: How long should a player's contract be? This question opens the door to age-old concerns of disincentives associated with long-term contracts. Previous research (Alchain & Demsetz, 1962; Hill & Spellman, 1983; Holmstrom, 1979) has highlighted some of the issues and problems associated with multi-year labor contracts. Indeed, the literature has drawn attention to the fact that productivity often suffers as a result of long-term job security. In particular, allegations of production declines due to long-term job security have been associated with seniority rights, professional athletes, and in the academic institution of tenure (Krautmann, 1990).

Specific to baseball, Ahlsrtom, Si, and Kennelly (1999), Lehn (1982), Scroggins (1993), and Woolway (1997) found statistically significant evidence of worker disincentives associated with multi-year contracts. On the other hand, studies conducted by Krautmann (1990), Marburger (2003), Maxcy (1997), and Maxcy, Fort, and Krautmann (2002) found no significant evidence of player shirking in connection with long-term contracts. Unfortunately, the theoretical framework surrounding employee performance is no less conflicting.

Much of the academic literature involving shirking centers on economic concerns of marginal productivity theory, property rights, and wage differentials. The current study deviated from the economic research by examining two general theories of social behavior in order to determine which is more applicable to baseball free agent research. Equity theory and expectancy theory were chosen because of their prior use in free agent performance studies and their contradictions in behavior predictions. Previous attempts to decipher which theory could be best used to predict behavior outcomes in terms of player performance have been inconclusive. Those attempts will be discussed in detail in the next chapter.

According to equity theory of job motivation research (Adams, 1963b; Adams & Jacobsen 1964; Adams & Rosenbaum 1962; Andrews 1967; Arrowood 1961; Goodman and Friedman 1968, 1969; Pritchard et al. 1972), when individuals perceive inequity as a result of under-reward, they will be motivated to reduce their performance. On the other hand, expectancy theory research (Gavin, 1970; Georgopoulous, Mahoney, & Jones, 1957; Goodman, Rose, & Furcon, 1970; Hackman & Porter, 1968; Lawler, 1966; Lawler & Porter, 1967, Porter & Lawler, 1968) supports the notion that when individuals perceive inequity as a result of under-reward, they will be motivated to improve performance.

In the case of Major League Baseball, free-agent performance has often been associated with expectancy theory predictions. The actual research regarding equity theory and expectancy theory predictions of free-agent performance (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991; Lord & Hohenfeld, 1979; Sturman & Thibodeau, 2001; Werner & Mero, 1999), however, is contradictory and inconclusive.

In today's baseball labor market, teams simply do not have the financial resources to sign every player they want to a contract (although the New York Yankees have attempted to prove otherwise). Teams must allocate their monetary resources to available player talent without compromising their budgetary limitations. As such, an organization's objective should be to use all available information to make decisions that will maximize the team's probability of winning games (Hadley, et. al, 2000).

According to Houston Astros General Manager, Tim Purpura, it is important for an organization to analyze and understand all aspects of player behavior and performance, especially as it relates signing and resigning players. Mr. Purpura added that free agency does affect the productivity of some players. "There is some legitimacy to the idea of player [shirking]. Some players excel in their walk year. It's just human nature (for players to over-perform in hopes of securing a financially lucrative contract)." Mr. Purpura used the example of a doctoral student who exerts a tremendous amount of effort and hard work writing a dissertation in order to receive a degree. “It is the same principle. [The student] is unlikely to maintain the same drive and focus after [he or she] graduates and receives the reward.” When asked how organizations could account for this perceived problem, Mr. Purpura mentioned his personal strategy. “You always analyze the situation. You look at a player’s history, from the first time they are arbitration eligible and see how they performed when they are first able to make serious money in the game.” Furthermore, Mr. Purpura suggested that while each individual is different, understanding how players performed in similar situations in the past could be the key to ascertaining how they will perform in the future (T. Purpura, personal communication, August 23, 2005).

Identifying and acknowledging situations in which players are most likely to alter outputs, such as instances of perceived inequity consistent with pre and post free agency, would be beneficial in understanding player behavior as it relates to free agency and its impact relative to performance. In the same manner that prior management, organizational psychology, and economic research has addressed issues of employee performance and productivity declines among workers, there is a still a need in the sport management literature to examine these concerns specific to sport.

Purpose of the Study

In the wake of Curt Flood’s monumental antitrust suit against Major League Baseball challenging the legality of its reserve clause, the door to the modern era of free agency was opened. Although Flood lost his legal battle with Major League Baseball and was denied free agency, an impartial arbiter, Peter Seitz, ultimately awarded veteran major league players the right to become free agents and negotiate their services with other teams (Pappas, 2002). On the eve of Flood’s court decision and Seitz’s ruling, legendary Oakland A’s owner Charles O. Finley, in an attempt to counter what appeared to be an inevitable change of baseball’s labor practices, actually proposed that teams sign all players to one-year contracts enabling them to become free agents. Like most of Finley’s ideas about how to revolutionize the game of baseball, (orange balls instead of white ones- Finley thought that hitters would be able to see the orange color better, especially at night, thus creating more offense and ultimately more excitement for the fans; two strikes and three balls instead of three strikes and four balls- one of Finley's attempts to speed up the game; a pitch clock for pitchers- another attempt to make a nine inning game shorter) it was quickly dismissed by his fellow owners. Finley rationalized his radical proposal of free agency by suggesting that players who signed guaranteed multi-year contracts would lose incentive to be productive. Finley argued that his idea would actually create lower salaries if players competed for jobs on a yearly basis instead of teams competing for a few players each year. In addition, Mr. Finley maintained that under his free agency proposal, owners would be able to better evaluate and control the level of productivity they were paying for each year (Kindred, 1996).

Three decades later, Charles Finley's idea of annual free agency exists in its original form, a proposal. One can only speculate as to how baseball would change given a different labor agreement centered on a seasonal "pay-for-play" performance context. Should it be assumed that there would be a difference in player performance based solely on the length of contracts? In a utopian society, one not influenced by money, pride, or prestige, one could legitimately argue that performance and productivity would remain the same regardless if players signed single-year contracts or multi-year agreements. Yet, the axiom that exists today in Major League Baseball is that players increase effort and productivity in their "option year" with expectations of benefiting financially with a new, more potentially lucrative contract as a result of their additional production. Larry Lucchino, then President of the San Diego Padres, said that players' performance is affected by free agency and that his beliefs are shared among many front office personnel throughout the league (Grad, 1998). Current San Diego Padres Chief Executive Officer, Sandy Alderson agrees. Mr. Alderson said:

> "[The axiom] is true to the best of my recollection, or at least that's been my impression based on the brief time that I've been in the game. I think there is a certain amount of human nature involved. I'm not sure that this is unique to baseball. There is a general belief that people who have more security are less motivated than those who have less security. Whether that's true or not, is anybody's guess. It might be a myth. Generally speaking, I think there are things that happen in the course of a player's free agent year that lead to a better result. For example, I can tell you in my experience with the Padres this year, there are players in their free agent years who do not want to go on the disabled list under any circumstances. Whereas, there are other players who are similar medically who, for whatever reason, go on the disabled list. I think there is a greater awareness of the consequences of their performance, of their physical conditions, of their attitudes. As they get closer to free agency they have

> much more concern about what those market variables are and how they are going to be perceived in that market. Players who are on the front end of a multiyear contract are less concerned and probably not concerned at all" (S. Alderson, personal communication, September 1, 2005).

While it is impossible to measure the individual effort of players anticipating the potential rewards of free agency, it is possible to formulate reasonable conclusions regarding the impact of free agency on player productivity. These inferences can be made by examining past performance leading up to and following free agency. Any dramatic changes in player productivity just prior to or shortly after this time period could suggest that the player's performance was influenced to some extent by his free agent status.

Past research looking at changes in player performance as a result of free agency has utilized much of the same methodology. However, most studies examining performance disparities within baseball, and sport, in general, have been theoretically framed within an economic context. Issues of marginal revenue productivity, salary, and value are often components of shirking research. While the economic perspective of player performance is certainly valuable, it is not the focus of this research. This study addressed performance concerns using proven social and organizational behavior theories in an attempt to predict how Major League Baseball player performance is affected by perceptions of inequity.

The purpose of this research study was to investigate whether Major League Baseball Players improve performance in their free agent year only to decrease performance in the year following a new contract. Specifically, this dissertation tested several competing hypotheses in regards to equity theory and expectancy theory predictions of performance behavior. The rationale for the current study surrounds the need for professional baseball owners to confront the age old debate of whether or not guaranteed multi-year free-agent contacts negatively affect performance (Ahlsrtom, Si, and Kennelly, 1999; Krautmann, 1990; Lehn, 1982; Marburger, 2003; Maxcy, 1997; Maxcy, Fort, and Krautmann, 2002; Scroggins, 1993; and Woolway, 1997).

The implications for this research could extend far beyond the sport. Confirmation of expectancy theory predictions, on average, player performance declines following free agency and the signing of multi-year contracts, could support arguments for one year contracts and annual salary negotiations and arguments against long-term job security associated with, for example, government employees and tenured professors (Woolway, 1997). Confirmation of equity theory predictions, however, could confirm the belief that worker productivity does not suffer as a result of long-term labor contracts.

Research Hypotheses

The following hypotheses were established as the basis for the current research study. Fourteen general hypotheses comparing equity theory and expectancy theory predictions within two general and six specific research questions are presented.

General Research Questions:

Does free agency affect Major League Baseball player performance? If so, then how?

Statistical Null Hypothesis: Free agency does not affect Major League Baseball player performance.

Equity Theory Hypothesis: Free agency negatively affects player performance in terms of initial declines in productivity as a result of perceived inequity.

Expectancy Theory Hypothesis: Free agency positively affects player performance in terms of initial improvements in productivity as a result of perceived inequity.

Specific Research Question One:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares from players' pre-option year to option year.

Equity Theory Hypothesis: Offensive productivity will decline in the option year when compared to the previous (pre-option) year.

Expectancy Theory Hypothesis: Offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Specific Research Question Two:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year.

Equity Theory Hypothesis: Offensive productivity will improve in the first year of a new contract when compared to the previous (option) year.

Expectancy Theory Hypothesis: Offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

Specific Research Question Three:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of age?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of age.

Equity Theory Hypothesis: Offensive productivity will decline in the option year when compared to the previous (pre-option) year.

Expectancy Theory Hypothesis: Offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Specific Research Question Four:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of age?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of age.

Equity Theory Hypothesis: Offensive productivity will improve in the first year of a new contract when compared to the previous (option) year.

Expectancy Theory Hypothesis: Offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

Specific Research Question Five:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of team winning percentage?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of team winning percentage.

Equity Theory Hypothesis: Offensive productivity will decline in the option year when compared to the previous (pre-option) year.

Expectancy Theory Hypothesis: Offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Specific Research Question Six:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of team winning percentage?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of team winning percentage.

Equity Theory Hypothesis: Offensive productivity will improve in the first year of a new contract when compared to the previous (option) year.

Expectancy Theory Hypothesis: Offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

The purpose of examining competing hypotheses is to support the validity of one theory over the other with respect to predicting player performance behavior in Major League Baseball. Harder (1991) noted that several theories have been proposed to explain the link between motivation and performance in organizations. Equity theory and expectancy theory are among the most widely used social behavior theories to predict how individuals will perform under perceived conditions of inequity (Harder, 1991). Specific to the topic of free agency, several studies have tried to ascertain which approach is more applicable to understanding how players will perform. The research (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991; Lord & Hohenfeld, 1979; Sturman & Thibodeau, 2001; Werner & Mero, 1999) examining these two theories in conjunction with free agent performance is conflicting. There are several reasons for the inconsistent results discussed in the next chapter, two of which can be explained by the researchers' use of limited data and questionable performance measures.

An important objective of this study was to provide support for equity theory or expectancy theory relative to predicting performance of Major League Baseball players. Achieving this objective necessitates examining tenets of both theories. If this study only used equity theory as the framework for this research, but the results did not support equity theory's predictions, then all the reader would be able to infer is that this research disproved a theory, thus limiting its interpretive and practical value. By examining the two theories which predict opposite performance results, the results should provide definitive support for equity or expectancy theory with respect to predicting performance of Major League Baseball players. Support for one of the two theories and the establishment of a clear framework will allow future researchers to build on this study in order to enhance future contributions to the sport management literature.

Definition of Terms

For the purpose of this study, the following terms are expertly or operationally defined:

Equity: a social comparison process used to establish what is fair and reasonable in an exchange (Adams, 1963, 1965; Walster, Walster, & Berscheid, 1978).

Expectancy: "……a momentary belief concerning the likelihood that a particular act will be followed by a particular outcome" (Vroom, 1964).

Free Agents: Major League Baseball players with at least six years of experience whose current contracts have expired, allowing them to negotiate their services with any franchise they chose.

Inequity: a social comparison process validated by a person's belief that the ratio of his or her outcomes to inputs differs from the ratio of a referent other's outcomes to inputs (Adams, 1965).

Inputs: contributions that individuals make to their work, which are often referred to in terms of education and training, hours worked, or effort (Pinder, 1984).

Instrumentality: the personal belief that first-level outcomes lead to second level outcomes (Vroom, 1964; Porter & Lawler, 1968).

Non-pitchers: Major League Baseball players whose defensive position includes catcher, infielder, or outfielder- also includes designated hitters.

OPS: a sabermetric statistic which measures a hitter's propensity for getting on base and his ability to hit for power and average.

Option Year: the last year of a free agent's contract; also referred to as "free agent year."

Outcomes: "the positive and negative consequences that the scrutineer perceives a participant has received in the course of his relationship with another" (Walster, Walster, & Berscheid, 1978).

Over-reward: the result of low inputs and high outcomes.

Referent: the individual or group referred to by any person for whom equity or inequity exists when making social comparisons of inputs and outcomes.

Runs Created: a sabermetric statistic which measures a hitter's total offensive contribution in terms of his ability to manufacture runs.

Sabermetrics: "the search for objective knowledge about baseball" derived from the acronym SABR, which stands for the *Society for American Baseball Research* (James, 1982).

Under-reward: the result of high inputs and low outcomes.

Valence: affective orientations (value) toward particular outcomes (Vroom, 1964).

Win Shares: a sabermetric statistic which measures a player's contribution to his team in terms of wins.

Scope of the Study

The current research study was designed to assess how free agency affects the performance of Major League Baseball players. The population was delimited to include Major League Baseball non-pitcher free-agents with at least six years of experience who sign multi-year contracts of two years or more. The data included offensive statistics for qualified subjects from 1976-2004. Specifically, sabermetric statistics- OPS, Runs Created, and Win Shares, were used to measure performance for subjects one year prior to a player's free agent year, a player's actual free agent year, and the year following a player's free agent year. The findings of this study will either support equity theory predictions- a player's performance will decline as a result of perceptions of under-reward, or expectancy theory predictions- a player's performance will improve as a result of perceptions of under-reward.

Limitations

The study will be subject to the following limitations:

1) This dissertation will focus exclusively on United States major league professional baseball players and the results may not be representative of other professional players in minor leagues or international associations.
2) Certain free-agents who changed teams may have experienced performance improvements or declines as a result of park factors (i.e. shorter/longer fences; smaller/larger alleys).
3) Some players may experience natural declines in performance due to age or injuries.

Assumptions

The following assumptions will be made regarding the proposed study:

1) Major League Baseball Players, in their free agent year, perceive themselves as under-rewarded in terms of monetary compensation when compared to referent others. This assumption is based on players playing out the remaining year of their long-term contracts and believing that they deserve a raise in pay based on what referent players are now making.
2) Major League Baseball Players perceive themselves as over-rewarded in the year following a new multi-year contract when compared to referent others. This assumption is based on guaranteed money for services not yet rendered. In others words, at the beginning of a new multi-year contract, most players

are promised compensation for future years regardless of effort, performance, or even injury. Thus, in the pay-for-performance context of professional baseball, players perceive over-reward.

3) Descriptive research and statistical analysis of the performance data would provide useful information for professional baseball owners and executives to make decisions regarding salary negotiation/arbitration concerns, free agent signings, player replacement values, scouting/draft strategies and expendable personnel.

Significance of the Study

With the inclusion of guaranteed multi-year contracts in the game, questions regarding incentives and motivation become relevant. It is not definitively known what impact, if any, these long-term contracts have on player productivity and performance. Many baseball insiders ascribe to the notion that long-term contracts negatively affect motivation as it relates to performance. According to Scott Proefrock, Assistant General Manager of the Tampa Bay Devil Rays, long-term contracts in connection with free agency has a significant impact on some players. Proefrock said:

> “Long-term contracts definitely take away the carrot (in reference to providing monetary incentives for players to maintain a consistent level of productivity). You are dealing with human beings so it’s hard to make generalizations about [their behavior], but it’s human nature. You almost expect it (S. Proefrock, personal communication, August 23, 2005).

However, actual research regarding shirking in relation to multi-year labor contracts in baseball is conflicting and contradictory (Marburger, 2003).

It is critical for team owners and general managers to 1) understand factors which affect player performance and 2) be able to effectively assess performance as it relates to winning games. The ability to accurately measure performance will allow an organization to determine the value of an individual player and estimate his potential for future contributions. In turn, an organization will be more equipped and better prepared to make decisions regarding player contracts and free agent signings. How can a team owner attempting to maximize profits afford to pay a player more than the value he produced for the team? In short, he can not.

The rationale for the current study stems from the need for owners to understand how free agency positively or negatively influences player performance. In an attempt to better understand the impact of free agency on player productivity, this dissertation looked at competing hypotheses of equity theory and expectancy theory predictions of player performance as determined using sabermetric measures. The present study contributes to existing professional research literature by providing answers to the following questions: 1) How does post option year performance differ from option year performance? 2) Does player productivity improve or decline as a result of free agency contracts? 3) Does post option year player performance support equity theory predictions or expectancy theory predictions?

It was important to conduct this research because the answers to the aforementioned questions should prove useful in determining if a free-agent should be signed, and if so, for how long. In particular, the use of sabermetrics provides an actual measurement of a player's complete individual contribution to his team which allows for the interpretation of a more definitive value assessment. The following chapter will outline the theoretical framework for this study as well as justify the use of an alternative approach to effectively evaluate player performance.

CHAPTER II

REVIEW OF LITERATURE

The following sections in this chapter outline two different organizational behavior theories focused on employee reaction to perceptions of inequity. This chapter discusses the derivation of each theory and reviews pertinent research supporting the context of this study. In addition, this chapter formally introduces sabermetrics as a more comprehensive performance measure compared to traditional statistics and offers justification for its use in this study.

The purpose of this research was to determine what impact free agency has on performance and which organizational behavior theory best supports the findings. Two competing theories of worker behavior predictions were used in order to establish a clear theoretical framework that provides valid support and direction for future research. Past research (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991; Lord & Hohenfeld, 1979; Sturman & Thibodeau, 2001; Werner & Mero, 1999) has differed on which theory is more applicable to baseball with regards to predicting free agent performance.

Equity Theory

J. S. Adams formulated an equity theory of job motivation in 1963. Adams' theory is based on the idea that people are motivated by "inequity." According to Adams (1965), a person perceives inequity to exist when that person believes that the ratio of his or her outcomes to inputs differs from the ratio of a referent other's outcomes to inputs. More specifically, the theory states that individuals hold perceptions about the number and value of the contributions they make to their work. These contributions are usually referred to as inputs. For example, people may consider the education and training they bring to their jobs, the number of hours they work, and how hard they try to perform when they are at their jobs (Pinder, 1984). Different people tend to pay attention to different inputs, and there is a tendency for people to place greater emphasis upon those inputs which they themselves have to offer (Cummings, 1980).

Outcomes are defined as the “positive and negative consequences that the scrutineer perceives a participant has received in the course of his relationship with another.” The participant’s outcomes are equal to the rewards that he obtains from the relationship minus the costs that he incurs (Walster, Walster, & Berscheid, 1978). In relation to work, outcomes can include pay, rewards intrinsic to the job, fringe benefits, job satisfaction, and status (Adams, 1965). However, as mentioned by Herzberg, Mausner, and Snyderman (1959), outcomes can also be negative. Poor working conditions, monotony, fate uncertainty, and overall job dissatisfaction are just a few examples of negative outcomes.

According to equity theorists (Adams, 1963a, 1965; Walster, Walster, & Berscheid, 1978) equity is characterized as a social comparison process used to establish what is fair and reasonable in an exchange. In fact, social comparison theory predicts that people attempt to compare their beliefs and attitudes with other individuals whom they perceive as being similar to themselves (Festinger, 1954). Specifically, people tend to compare themselves with three types of others: (1) people with whom they are in an actual association, (2) people they admire and look up to, and (3) people they perceive to be very similar, or very different, from themselves along some dimension (Walster, Walster, & Berscheid, 1978).

During the social comparison process, inputs and outcomes are considered in ratio terms rather than absolute terms. The comparison takes the form of the following ratio:

$$\underset{\textbf{SELF}}{\frac{\text{Inputs}}{\text{Outcomes}}} \quad : \quad \underset{\textbf{REFERENT}}{\frac{\text{Inputs}}{\text{Outcomes}}}$$

When the ratio is in balance, (i.e., inputs and outcomes between an individual and a comparative referent are equal), the individual perceives equity. Inequity is perceived when the ratio is out of balance. When an individual perceives that his or her inputs are equal to the referent and his or her outcomes are lower, or that his or her inputs are greater and outcomes are equal, a tension results and inequity is felt (Scholl, 2000). In fact, Adams (1963) noted that the tension is especially strong when the referent’s outcomes are perceived as higher than our own, while that person's inputs are simultaneously perceived to be lower.

Equity theorists (Adams, 1963a, 1965; Walster, Walster, & Berscheid, 1978) maintain that individuals who encounter inequitable circumstances experience dissatisfaction and will be motivated to restore equity or reduce inequity. The strength of motivation to do so will vary directly with the magnitude of inequity experienced. According to Harder (1991), the restoration of equity can be accomplished in one of several ways. Outcomes and inputs can be altered, objectively or psychologically; comparative referents can be changed; or the individual can withdraw from the situation. Adams (1965) proposed that individuals reduce or eliminate inequity by altering inputs such as their performance.

Equity Theory Framework

Adams' Equity Theory is a more general theory of worker motivation. As such, it can be used to study and examine a variety of individuals in settings where work is being conducted (Walster, Walster, & Berscheid, 1978). The academic research involving studies in which equity theory was used to predict the behavior of workers under inequitable conditions is vast and continues to grow (Colquitt, et. al. 2001). The following sections discuss the earliest applications of equity theory research which continues to serve as the foundation and theoretical framework for future investigations.

Past research involving reactions to inequity has mainly been conducted in laboratories (Mowday, 1987). According to Hauenstein and Lord (1989), more research into the relationship between perceptions of inequity and performance in organizational settings is needed. The conventional experiment involves (1) subjects performing a task, (2) distribution of a monetary reward, and (3) measurement of performance on a subsequent operation of the task. Conditions of inequity are manufactured through the manipulation of rewards and performance feedback, and individual responses to these inequitable situations are measured (Harder, 1991). According to equity research reviews (Adams & Freedman, 1976; Goodman & Friedman, 1971: Greenberg, 1982, 1987, 1990; Walster et al., 1978), early studies conducted in laboratories have revealed that perceptions of inequity with regard to pay can significantly affect an individual's performance.

In an examination of Adam's theory of inequity, Goodman and Friedman (1971) concluded that the theory can be divided into two general categories: those dealing with the conditions of inequity and those dealing with the resolution of inequity. With respect to resolution of inequity, there have been four types of studies conducted: overpaid-hourly, overpaid-piece rate, underpaid-hourly, and underpaid-piece rate. "Piece rate" also refers to "pay-for-performance." In professional baseball, players are compensated in a pay-for-performance context.

Inequity As a Result of Overpayment

The basic hypothesis for research concerning overpaid-hourly subjects involves overpaid individuals reducing inequity by increasing inputs. Such was the case in a study conducted by Adams and Rosenbaum (1962) where overpaid subjects were told that they were less qualified than other subjects who were equitably paid. The experiment involved subjects conducting public opinion interviews. The prediction based on equity theory was that the overpaid subjects would try to increase their inputs so that equity could be restored. It was assumed that the overpaid subjects would obtain more interviews in the allotted time than the control group. In fact, that is what the results demonstrated.

Similar findings with result to overpaid-hourly studies have been published by Arrowood (1961), Adams (1963b), Goodman and Friedman (1968), Goodman and Friedman (1969), and Pritchard et al. (1972). In Arrowood's study (1961), experimental conditions also revolved around subjects hired to conduct interviews, with the experimental group made to feel under-qualified and overpaid and the control group made to feel qualified and equitably paid. However, in this particular study, the subjects were led to believe that the experimenter would never see their work. This implied anonymity would ensure that subjects would behave and work based on an internal and self-motivating need for the restoration of an equitable environment. The results of Arrowood's study confirmed the theory that overpaid subjects produce significantly more than equitably paid subjects.

Not all studies support equity theory predictions with regards to overpaid-hourly subjects. In particular, studies conducted by Valenzi and Andrews (1971), Lawler (1968b), and Anderson and Shelly (1970) found no differences between equitably and inequitably paid groups in terms of productivity and performance. In the Valenzi and Andrews study (1971), workers were not told whether they were "qualified" for their clerical jobs, eliminating what the researchers referred to as "devalued self-esteem." Instead, after one working session, the subjects' pay was decreased, increased, or left the same. Despite the manufactured inequitable conditions, no significant work performance differences could be determined between the three groups.

Anderson and Shelly (1970) in a similar manner found no differences between equitably and inequitably paid groups despite the researchers reinforcing the idea that some subjects were more qualified than others. The authors argued that previous overpayment inequity research, such as those conducted by J. S. Adams in the 1960s, introduced contaminating factors contributing to inaccurate results. Among the factors mentioned were manipulation of self-image, self-esteem, and worker competence. Anderson and Shelly maintained that the results supporting equity theory predictions from previous studies were more indicative of an overpaid subject's need to demonstrate competence and confirm self image and less an indication of a worker's desire to reduce inequity. Prior to this particular study conducted by Anderson and Shelly (1970), Lawler (1968b), went so far as to say that perceptions of overpayment were not enough to motivate workers to increase productivity, a direct contradiction of equity theory predictions.

The basic hypothesis with overpaid-piece rate studies is that overpaid subjects will produce higher quality and lower quantity than equitably paid controls. Like overpaid-hourly subjects, it is assumed that overpaid–piece rate subjects will increase their inputs as a means of achieving equity. As a result, these inputs can lead to greater quantity or quality. However, increases in quantity can only expand inequity since every "piece" is overpaid. Therefore, the hypothesis assumes that inputs are invested in increased quality so that combined inputs and outcomes produce a balanced and equitable relationship (Goodman and Friedman, 1971).

Studies by Adams and Rosenbaum (1962), Adams (1963b), Adams and Jacobsen (1964), Andrews (1967), and Goodman and Friedman (1969) all support this hypothesis in that their experiments reported lower quantity and higher quality for the overpaid group. For example, an examination of Adams' study (1963b) where subjects were again asked to conduct public interviews illustrates how subjects induced to feel unqualified and overpaid actually lowered productivity in order to improve the quality of their outcomes.

Inequity As a Result of Underpayment

In connection with underpaid-hourly studies, the basic hypothesis deals with underpaid subjects decreasing their inputs in order to achieve equitable input-outcome relationships. It should be noted that Adams' hypothesis does not decipher which outcome, either quality or quantity, is affected by the change in input. However, studies suggest that the emphasis on quality or quantity outputs is related to experimental task requirements and the relationship between the two outcomes themselves (Goodman and Friedman, 1971). In particular, there are three widely recognized underpaid-hourly research studies testing Adams' hypothesis: Evan and Simmons (1969), Valenzi and Andrews (1971), and Pritchard et al (1972).

Evan and Simmons (1969) conducted two experiments where subjects hired as proofreaders were confronted with one of two organizational sources of inequitable payment. In the first experiment, subjects were underpaid based on induced levels of competence. The results of this experiment were consistent with Adams' theory in that the underpaid subjects received fewer inputs from the job than deemed just, and resolved the feelings of inequity by reducing the quality of their outputs significantly.

In the second experiment, subjects were underpaid based on induced levels of authority. However, the results of this experiment did not support the hypothesis in that pay had no significant effect upon quantity or quality of performance. Thus, it can be assumed that, at least in this experiment, the induction of authority probably did not create strong feelings of inequity, and therefore, was not a valid test of the hypothesis.

A study conducted by Pritchard et al. (1972), also supported Adams' theory by determining that subjects exposed to underreward and overreward conditions were less satisfied than subjects who felt equitably paid. Specifically the study examined worker performance and satisfaction through experimentally induced and naturally induced feelings of inequity.

On the other hand, a study by Valenzi and Andrews (1971) did not confirm Adams' theory. In this particular study, three groups- overpay, underpay, and control- were established in a before-after design consisting of thirty one subjects hired for clerical work. Even though three of the eleven underpaid subjects quit before the conclusion of the experiment, no significant differences were found among the three groups in terms of work performance. Thus, Valenzi and Andrews' findings are contrary to inequity theory predictions and previous inequity theory experiments.

With regard to underpaid-piece rate studies the basic hypothesis is that underpaid individuals will produce a large number of low-quality outputs in comparison to equitably paid individuals (Mowday, 1987). In addition, the production of low quality outputs permits increasing outcomes without substantially increasing inputs (Goodman and Friedman, 1971).

A study conducted by Andrews (1967) supported this hypothesis. The experiment focused on job performances of student workers paid at one of three piece rates - equitable, underpaid, and overpaid. As predicted, the results showed that underpaid subjects maintained equity by increasing work quantity and decreasing work quality. A study conducted by Lawler and O'Gara (1967) examined Adams' theory of inequity by focusing on piece rate underpayment. Their study explored the effects of underpayment inequity on subjects hired to conduct interviews. Results for the study supported Adams' theory by revealing that the underpaid subjects produced more interviews than the equitably paid control group, but the interviews were of lower quality.

Conditions of Inequity

With respect to the conditions of inequity, there have been several studies (Andrews, 1967; Goodman, 1974; Lawler, 1965; Penner, 1967; Pritchard et al., 1972; Weick & Nesset, 1968; Wicker & Bushweiler, 1970) concerning determinants of feelings of inequity and the psychological state of inequity. According to the research, some determinants of inequity might include the perception of a referent other, past input-outcome ratios along with future expectations, specific characteristics of an individual and his outcome source, and organizational factors (Goodman & Friedman, 1971).

Lawler (1965) found the role of a comparison other can affect feelings of inequity when he questioned managers from government and private organizations with regards to pay differences between themselves and their superiors and subordinates. Subjects in this experiment reported pay differences to be too small, especially between themselves and their subordinates. Moreover, in terms of inequity theory, research (Andrews, 1967; Weick & Nesset, 1968) indicates that the threshold for underpayment is lower than for overpayment (Levanthal, Weiss, & Long, 1969).

Also, Wicker and Bushweiler (1970) discovered that perceptions toward others determined feelings of inequity in terms of likeability of the referent. In addition, in connection with Adam's (1965) assumption that a person "will reduce inequity, insofar as possible, in a manner that will yield him the largest outcomes," Weick and Nesset (1968) discovered that subjects in fictitious work situations chose equitable conditions of a comparison other's input-outcome ratio instead of their own input-outcome ratio. Likewise, subjects also consistently compared themselves to others with regards to different equity comparison processes.

Determining just how individuals choose comparison standards to evaluate inputs and outcomes is crucial to all aspects of equity theory research. Adams (1965) stated that comparison others were "the other party to the exchange or another individual involved in an exchange with the same third party." In other words, comparison others are reference points or examples used to establish varying degrees of equitable and inequitable perceptions.

According to research conducted by P. S. Goodman (1974), individuals often rely on multiple comparisons when assessing the balance of equity. Goodman's study examined 217 management level employees and the processes involved in determining pay satisfaction. Goodman concluded that comparisons are made among three different groups of referents: (1) others, (2) self-standards, and (3) system referents. First, others are defined as being those individuals involved in a similar exchange. This is the most common type of comparison. Second, self-standards refer to comparisons made based on past experiences. For example, an individual may compare current input/outcome ratios to input/outcome ratios of a previous job. Third, system referents refer to comparisons based on the potential for future rewards.

With regards to how the past affects the present in terms of equity perceptions, Pritchard et al. (1972) found that past perceptions of equity and inequity could be a determinant of present performance and feelings of inequity. Their experiment was conducted testing equity theory deductions under experimentally induced and naturally induced feelings of inequity by manipulating pay systems over the course of a week.

Other determinants affecting feelings of inequity, such as individual characteristics and organizational factors, have been studied as well. For example, Penner (1967) was able to correlate level of performance and pay satisfaction in the context that high performers were likely to be more dissatisfied with their pay.

New Directions in Equity Theory Research

The preceding content represents the foundation and theoretical framework for equity theory and its impact on worker performance. Building on those studies, researchers have expanded the literature to include studies involving job satisfaction, referent selection, organizational commitment, and reward systems. The following paragraphs present examples of these studies relevant to this research.

According to Lucero and Allen (1994), today's workers do not feel that their efforts are just commodities that can be sold to the highest bidder. They contend that employees value dependable, predictable exchange relationships with their employers. While loyalty is not exactly synonymous with player/management relationships in professional baseball, some studies suggest that a psychological contract develops within an employment relationship in which employees believe their labor contributions obligate their employer to reciprocate by promising to provide future rewards (Rousseau & Greller, 1994). In fact, some argue that violations this psychological contract could potentially impact all involved and effect equity perceptions. Lucero and Allen (1994) write:

> Failure to meet the terms of a psychological contract produces more than just unmet expectations. It signals damage to the relationship between the organization and the individual. Underlying the psychological contract is trust, which develops from a belief that contributions will be reciprocated and that a

> relationship exists where actions of one party are bound to those of another. A damaged relationship is not easily restored (p. 431).

In addition, Jaques (1990) found that workers who experienced inequity as a result of violations of trust are more likely to have negative feelings toward management, lack motivation, and alter their inputs, ultimately affecting their overall job satisfaction and productiveness.

What role does job satisfaction really play in how an individual performs at his or her job? Does job satisfaction affect effort? Research has shown high productivity to be positively correlated with job satisfaction (Pratkanis & Turner, 1994). The problem lies in trying to quantify and measure job satisfaction. Research has found job satisfaction to be positively related to inequity perceptions (Keller, 1997). It is reasonable to assume that factors which affect a worker's satisfaction level are tied to those feelings which create perceptions of inequity (Pinder, 1984). According to equity theorists (Adams, 1963, 1965; Walster, Walster, & Berscheid, 1978), the single most important factor affecting feelings of inequity for workers is referent selection. As a result, much research has been conducted on referents and their relationship to job satisfaction, performance, and the balance of equity. Specific to sport, Smucker (2001) examined job satisfaction and referent selection of various sport administrators. He concluded that sport managers overwhelmingly selected referents in their determination of equity, overall work satisfaction, and pay.

Overall, findings from prior equity theory research generally support Adams's contention that inequity motivates individuals to change their inputs in favor of more desirable outcomes. However, since most of the studies relied on manufactured experimental conditions conducted in controlled environments, it is difficult to substantiate the validity of the findings. In nearly all of the studies, referent comparison was the biggest factor in the determination of inequity. In addition, workers were more likely to alter inputs as a result of underpayment than overpayment. In the context of the current study, this would mean that player performance would decline more in the option year as a result of perceptions of underreward than it would improve the year following the signing of a new contract as a result of perceptions of over-reward.

Expectancy Theory

Perhaps the most popular theory of work motivation among organizational scientists in recent years is Valence-Instrumentality-Expectancy Theory (VIE Theory) or Expectancy Theory (Locke, 1975). The theory was developed in the 1960s by a researcher named Victor Vroom. Vroom's theory and its derivatives are based on predicting behaviors and explaining decision-making processes based on motivational forces and value perception. Vroom's model of work motivation is drawn from "instrumentality" conceptualizations from Peak's (1955) Instrumentality Theory which hypothesizes that an individual's attitude toward an outcome depends on his perceptions of relationships (instrumentalities) between that outcome and the attainment of various other consequences toward which he feels differing degrees of liking or disliking (valence). In addition to instrumentality and valence, Vroom introduces the concept of expectancy into his model for work motivation (Graen, 1969).

In an extension of Vroom's (1964) Expectancy Theory, Porter and Lawler (1968) hypothesized that performance is a function of the interactions among instrumentality, valence, expectancy, ability, and role perceptions. The only considerable difference between the two theories is the inclusion of role perceptions as an additional measure of performance (Heneman & Schwab, 1972). Porter and Lawler (1968) define role perceptions as "the direction of effort-the kinds of activities and behaviors the individual believes he should engage in to perform his job successfully."

According to Expectancy Theory of motivation (Vroom, 1964; Porter & Lawler, 1968), individuals make decisions to perform based on cognitive concepts of subjective probabilities. Further, these cognitions are representative of an individual's perception of the likelihood that effort will lead to performance and performance will lead to desired outcomes. Specifically, Vroom's theory assumes that "the choices made by a person among alternative courses of action are lawfully related to psychological events occurring contemporaneously with the behavior" (1964).

The purpose of Expectancy Theory is to understand motivation in organizations and how individuals make decisions regarding various behavioral alternatives (Mitchell & Biglan, 1971; Nadler & Lawler, 1977; Porter & Lawler, 1968; Vroom, 1964). As Nadler & Lawler (1977) point out, Expectancy Theory focuses on a number of specific assumptions about the causes of behavior in organizations. The assumptions are as follows: (1) behavior is determined by a combination of forces in the individual and forces in the environment, (2) people make decisions about their own behavior in organizations, and (3) different people have different types of needs, desires and goals which can influence performance.

Vroom's Expectancy Theory or VIE Theory (1964) is based on three perceptions, valence, instrumentality, and expectancy, each of which individually can influence an individual's motivation, but which together can have a more powerful affect. Valence refers to affective orientations (value) toward particular outcomes. An outcome is said to be positively valent for an individual if he or she prefers attaining it to not attaining it. An outcome which a person would prefer to avoid is said to be negatively valent. An outcome can be perceived as having value in itself or because of its instrumentality in achieving other valued ends. Valence is a function of an individual's needs, goals, values and sources of motivation (Vroom, 1964).

Expectancy theorists (Porter & Lawler, 1968; Vroom, 1964) define instrumentality as the personal belief that first-level outcomes lead to second level outcomes. In other words, if an individual believes that a high level of performance is instrumental for the attainment of other outcomes that he expects will be rewarding (such as a pay increase, for example), and/or if he believes that a high performance level will be instrumental for avoiding other outcomes that he wishes to avoid (such as being fired), then that individual will place a high valence upon performing well. When individuals perceive that valued rewards follow all levels of performance, then instrumentality is low (Pinder, 1984).

Expectancy is defined as "a momentary belief concerning the likelihood that a particular act will be followed by a particular outcome" (Vroom, 1964). This belief, or perception, is generally based on an individual's past experience, self efficacy, and the perceived difficulty of the performance standard or goal (Porter & Lawler, 1968).

Vroom (1964) suggests that expectancies, instrumentalities, and valences interact psychologically within an individual's beliefs to create a motivational force which in turn influences behavior. Further, Vroom maintains that when deciding among behavioral options, individuals select the option with the greatest motivation forces. Vroom's theory can be summarized as follows:

Motivation Forces = Expectancy x Instrumentality x Valence

Expectancy Theory Framework

Several research studies have examined employee performance by testing expectancy theory hypotheses. In particular, early studies like the ones conducted by expectancy theorists Vroom, Porter, and Lawler have helped establish the framework for expectancy theory research. Even before Vroom (1964) published his theory, scholars began researching the basic principles and foundations of expectancy theory. In an attempt to measure productivity among workers, Georgopoulous, Mahoney, and Jones (1957) preceded Vroom's (1964) and Porter and Lawler's (1968) theories by testing a segment of expectancy theory on 621 household appliance manufacturers. Specifically, their study looked at factors affecting high productivity as a function of a path-goal approach. Instrumentality and valence perceptions were used to determine productivity measures. The researchers found that productivity was directly associated with worker pay expectations.

Lawler (1966) examined the effects of instrumentality and ability on performance. Subjects included state workers who were asked to measure the instrumentality of quality, productivity, and effort as a determinant of pay. Ability was determined by self-evaluation and supervisor ratings. Ability in this case was defined as an individual's currently developed power to perform. The study discovered that instrumentality effects proved significant for performance only.

Galbraith and Cummings (1967) studied levels of valence in conjunction with the instrumentality of their attainment (performance). They examined valence ratings for seven second-level outcomes as given by 32 industry workers. The researchers also measured ability by length of time spent at the job. Performance was measured by worker output over a one month period. This particular study found no significant interactions between ability, valence and instrumentality.

In a similar study, Hackman and Porter (1968) investigated valence ratings of eighteen second-level outcomes in connection with the instrumentality of their attainment. Subjects in this study were made up of 82 telephone customer service representatives. Each subject was scored based on four criteria: valence, instrumentality, valence plus instrumentality, and valence multiplied by instrumentality. Each criterion was correlated with job performance and median correlations were measured. Results supported a strong valence-instrumentality interaction effect.

Likewise, Goodman, Rose, and Furcon (1970) studied valence and instrumentality of second level outcomes. This particular experiment also looked at levels of motivation force affecting desired outcome attainment. Sixty six government employees were interviewed and a total of seven instrumentality factors were measured for each subject. Researchers found significant correlations for each factor.

Lawler and Porter (1967) investigated the effects of valence, instrumentality, role perceptions, and their interactions on performance. Specifically, the researchers attempted to ascertain the importance and value of high productivity, effort, and good job performance towards the attainment of second-level outcomes. The median correlations between interactions were reported and the study found that while no significant correlations between groups existed, there was support for the effects of effort in terms of role perceptions on performance. Porter and Lawler (1968) repeated the study a year later increasing the sample size from 154 to 635. This time the findings suggested support for the effects of instrumentality on performance in addition to role perceptions.

Gavin (1970) examined the effects of valence, instrumentality, ability, and role perceptions on worker performance of 367 insurance company employees. Subjects rated the instrumentality of good job performance and hard work for the attainment and valence of twenty one second-level outcomes. Effort was determined by supervisor and self ratings, and ability was measured by a mental aptitude test. Results yielded little support for interaction effects with respect to performance.

Overall, expectancy theory research supports the idea that individuals choose to alter inputs based on preferences among desired outcomes and the probability of attaining those outcomes at a satisfactory level. Studies have shown that each component of expectancy theory- expectancy, instrumentality, and valence- is an important factor in determining the extent to which an individual is motivated to increase or decrease productivity. Ultimately, value perceptions are the strongest determinant of effort. In terms of the current study, past research suggests that the level at which option year performance improves depends on the individual player's attitude toward monetary rewards. Players who place a greater emphasis on achieving wealth through signing financially lucrative contracts will be more motivated to improve performance than a player for whom money is less important. Consistent with expectancy theory, the current study assumes that all Major League Baseball players value monetary rewards.

Equity Theory versus Expectancy Theory

The relationship between equity theory and expectancy theory has been the focus of considerable work among organizational theorists (Harder, 1992). Much of the original interest in equity theory occurred from the fact that it made predictions about individual behavior that were difficult to integrate into existing theories of motivation (Weick, 1967). For example, equity theory and expectancy theory make different predictions under conditions of perceived under-reward combined with strong performance-outcome expectancies. Under equity theory, an individual who perceives himself to be under-rewarded will be motivated to decrease the inequity by decreasing his performance. In contrast, expectancy theory suggests that the individual may increase his performance if he perceives the outcome or rewards to be strongly desirable (Harder, 1991). Considerable research interest has been generated in trying to test these seemingly competing predictions (Mowday, 1987).

After reviewing equity theory research, Lawler (1968) and Campbell and Pritchard (1976) noted that under certain conditions, equity considerations can in fact be included under expectancy theory. In particular, Lawler (1968) looked at overpaid-hourly equity studies considering effects on productivity and work quality. He concluded that if perceived equity was seen to affect the valence of outcomes and in turn affect motivation, then expectancy theory could explain the results of equity theory research. Thus, Lawler suggests that expectancy theory is as effective as equity theory in predicting performance in paid work situations.

Campbell and Pritchard (1976) maintained the two theories are not in conflict because of their ambiguity and their vagueness as to how the theories are defined. However, because of the ambiguous nature of the two theories and the lack of substantial evidence concerning equity perceptions affecting the valence of outcomes, Mowday (1987) suggests that it may be premature to conclude that equity theory can be incorporated into and explained by expectancy theory. Likewise, Adams (1968), in response to Lawler's study (1968b), argues for a more multi-dimensional approach to predicting performance. Instead of initially defining performance by either equity or expectancy parameters, Adams (1968) suggests identifying individual behavior conditions to decide which characteristics can best be studied by which motivation theory.

In addition, regardless of one theory's dominance or superiority over the other, both theories hold the same basic assumption: that people base their actions on perceptions and beliefs. Specifically, these theories hypothesize the importance of perceptions and beliefs influencing behavior in terms of work related performance. According to Pinder (1984), both theories are equally weak in their attempt to predict levels of work effort and performance because such behavior is mainly subjective to the evaluator or researcher.

While Pinder's contention is mostly true, in most work settings effort and performance are difficult to measure or quantify. Pinder does not take into account work environments where effort and performance are not completely subjective, such as professional sports, in particular, professional baseball. Sports are unique in that workers (players) are measured by the same impartial predetermined performance standard which is easily quantifiable and may be compared interchangeably with past and future generations of workers, thus making professional baseball an excellent setting to conduct research testing equity theory and expectancy theory hypotheses with respect to predicting performance.

This study supports the utility of one of two organizational behavior theories with regard to player performance adjustments indicative of free agency perceptions. It is important to examine both equity theory and expectancy theory in order to determine a definitive framework for future research. Previous studies have specifically examined the function of equity and expectancy theories in predicting individual player performance in Major League Baseball. Most of the research compared pre and post free agency performance in order to determine disparities between the two. The following section discusses this research in detail.

Equity and Expectancy in Major League Baseball

Lord and Hohenfeld (1979) conducted the first research experiment testing equity theory predictions on Major League Baseball players. Subjects consisted of 23 non-pitchers who began the 1976 season without contracts. Only hitters were included as subjects because pitchers have different roles and responsibilities not easily measured by equal standards. For example, starting pitchers are generally scheduled to pitch every fifth game at which time they are expected to pitch most of the game. On the other hand, relief pitchers are concerned with pitching more frequently to fewer batters. Starting pitchers are evaluated in terms of wins and losses, where as relievers are measured by their ability to hold or save games. In contrast, hitters are all evaluated by equal offensive measurement standards.

The significance of the year (1976) for this particular study was based on the landmark collective bargaining agreement between players and ownership which allowed players to become free agents and negotiate their services with other major league teams after six years. Prior to this collective bargaining agreement, players were bound to a particular team by the “reserve clause,” a clause first introduced in 1897 which gave owners the right to their players’ services indefinitely (Holtzman, 1977).

Lord and Hohenfeld (1979) argued that, with the inception of free agency, the 1976 season provided a situation where equity theory predictions could be tested based on the following three factors: (1) the existence of external referents- those ballplayers who capitalized on their free agents status and received substantially greater outcomes in terms of salary contracts, (2) the chance to increase future outcomes (salary) by signing with a new team- those subjects without contracts could play out their option year and sign with another team as a free agent the following year, and (3) the feelings of under-compensation and under-reward in a player’s option year- most players who played out their option year in 1976 received a substantial cut in pay. For these reasons, Lord and Hohenfeld (1979) posited that “baseball players who began the 1976 season while playing out their options would have been motivated to reduce the concomitant tension”

(p. 20). The researchers expected player performance to decline when compared to years prior as a result of the inequity that each player perceived. Performance was measured in terms of batting average, home runs, runs scored, and runs batted in.

Lord and Hohenfeld (1979) reported a significant decline in performance for the 23 subjects with respect to three out of the four performance measures: batting average, home runs, and runs batted in. The researchers concluded that the decrements in performance, under perceived conditions of inequitable reward and under-compensation, were consistent with equity theory predictions.

In an extension of Lord and Hohenfeld's (1979) research, Duchon and Jago (1981) assessed the effects of inequity perceptions on the performance of free agents who signed with new teams over the first three years of the free agent draft, 1976-1978. Subjects consisted of 30 non-pitching major league baseball players. As in Lord and Hohenfeld's (1979) study, Duchon and Jago used four offensive performance measures: batting average, home runs, runs batted in, and runs scored. The data was compiled for each subject over the course of five years: three years prior to their option year, their actual option year, and one year after signing a new contract.

Duchon and Jago's (1981) study failed to corroborate with Lord and Hohenfeld's (1979) findings and thus did not support equity theory predictions that perceived inequity among major league baseball players would be translated into a significant performance decrement in the option year and return to normal performance in the first year with a new team. The results of this study yielded no significant performance declines for players in their free agent years when compared with the previous years' production. After dividing their subjects into first year (1976), second year (1977), and third year (1978) free agents, the researchers noticed significant performance decline for first year free agents (1976), supporting Lord and Hohenfeld's contention. Yet, when they compared performance measures of second year (1977) and third year (1978) free agents with previous years' production, performance actually increased, contradicting equity theory predictions.

Duchon and Jago (1981) explained their findings by describing the first year of free agency (1976) as uncertain and without precedent in terms of contract negotiations and monetary rewards (previous free agents had been pitchers). In other words, first year free agents did not understand the impact that collective bargaining and free agency would have on their future income potential. Thus, they were probably not motivated to increase performance in their option year based on the potential for greater rewards (salaries). However, second year (1977) and third year (1978) free agents were able to see the dramatic change in the salary structure of the sport by witnessing first hand the new contracts that first year free agents received following the 1976 season. As a result, the researchers assumed that second and third year free agents were motivated to increase performance in order to capitalize on the escalation of player salaries. Duchon and Jago chose to interpret these findings within an expectancy theory framework.

The two aforementioned studies (Duchon & Jago, 1981; Lord & Hohenfeld, 1979) presumed that individuals playing out their option felt under-compensated, whereas those signing new contracts did not. Those presumptions were based on referent comparisons between free agents and players with new long-term contracts. Werner and Mero (1999) used that same presumption as the basis for a more comprehensive study of how equity perceptions affect player performance. The researchers tested six hypotheses that relate three different types of inequity to changes in performance. The three types of inequity measured were external, internal, and employee. First, external inequity was measured by comparing salaries for batters from one team to batters from other teams. Second, internal inequity was measured by comparing salary differences between batters and pitchers on a single team to other teams. Third, employee inequity was determined by comparing the salaries of batters on the same team. Based on the hypotheses, the authors sought to prove that underpayment was negatively related to changes in performance, whereas overpayment was positively linked to performance changes- a notion consistent with equity theory predictions.

Subjects consisted of 205 non-pitchers and 157 pitchers, all of whom played actively during the 1991 and 1992 seasons and had at least two years of major league experience. Player performance was measured using Runs Created and Total Player Rating, two sabermetric measures foreign to many equity researchers and baseball purists. Because of the unfamiliarity with the “new” performance metrics proposed in Werner and Mero’s study, it would have made sense to properly introduce the concept of sabermetrics to the readers and at least minimally justify its use over the more recognized traditional measures. However, the authors failed to discuss sabermetrics and their rationale for using them in their study. One can only assume how this oversight could potentially compromise the credibility of their findings if the measurements used to obtain the results are not completely understood.

Werner and Mero (1999) conducted two regression analyses in order to determine which players were over-compensated and which players were under-compensated and how each affected performance. The results indicated that both employee equity and external equity were related to changes in player performance and consistent with equity theory predictions. Underpaid players experienced a decline in their production whereas overpaid players improved their performance. In addition, employee equity was found to be the greatest predictor of change. According to the authors, guilt was the biggest motivating factor for the overpaid players' production improvements.

Similar to Duchon and Jago (1981), Harder (1991) studied competing predictions of equity theory and expectancy theory on performance. Harder's study investigated the production for 106 non-pitcher major league baseball free agents between 1977 and 1980. Unlike Lord and Hohenfeld's (1979) and Duchon and Jago's (1981) research, Harder only used two performance measures: home runs and batting average.

Harder (1991) based his hypotheses on several player salary determination studies (Chelius & Dworkin, 1980, 1982; Hill & Spellman, 1983, 1984; Pascal & Rapping, 1972; Scully, 1974a, 1974b, 1989), which concluded that certain performance measures would be more predictive of increased salaries than others. In particular, the studies found that statistics for slugging percentage and home runs were more closely associated with higher salaries than traditional measures such as batting average.

Harder (1991) proposed that equity and expectancy predictions should support the aforementioned research. Specifically, since home runs were found to be closely related to larger salaries, then expectancy theory predictions of increased home run production by free agents should prove true. Likewise, because batting average was reported to be not as closely related to increased salaries, Harder thought it reasonable to assume that equity theory predictions of decreased performance should prove true. In other words, given a strong performance-outcome expectancy, performance will increase. On the other hand, given a weak performance-outcome expectancy, performance will decline. Harder maintained that he would be able to more accurately predict performance by analyzing production at an individual level, rather than at a group as previous studies had done (Duchon and Jago 1981; Lord & Hohenfeld, 1979).

The results of Harder's research supported his contention that players faced with inequitable under-reward would decrease performance if that performance was not strongly linked to future rewards (player's batting averages declined in their free agent years). This contention was consistent with equity theory. Results also supported Harder's second contention that players faced with inequitable under-reward would not decrease performance if that performance was strongly linked to future rewards (player's home run ratio did not decline in their free agent years). This contention was not consistent with equity theory.

Harder's results further indicated that while home run production did not decrease for free agents as equity theory would predict, they also did not increase as expectancy theory would predict. Thus, Harder concluded that players faced with inequitable under-reward will generally decrease performance to restore equity to the extent that their production decline does not affect future rewards.

Another study investigating equity theory and expectancy theory predictions of performance for free agents conducted by Ahlstrom, Si, and Kennelly (1999) sought to answer the age old question that every Major League Baseball owner would like to know: "Do teams get what they expect?". The researchers looked at 172 non-pitcher major league baseball free agents who signed contracts with new teams between 1976 and 1992. Four performance criteria (home runs, batting average, slugging average, and runs batted in) were measured for three consecutive years: one year prior to a player's option year, a player's option year, and the year following a player's option year. In addition, the researchers compared these performance measures with career average using competing equity theory and expectancy theory prediction hypotheses.

Results of this study generally supported expectancy theory predictions of player performance. Specifically, the study revealed no significant increases in player production when comparing players' option years to previous years and players' option years to career averages. On the other hand, researchers noted significant decreases in player production when comparing the years following players' option years to actual free agent years and players' option years to career averages. Thus, in this case, expectancy theory predictions for free agent performance held true. As a result of their findings, Ahlstrom, Si, and Kennelly (1999) concluded that with respect to guaranteed multi-year contracts, owners do not "get what they pay for" in terms of production if new player contracts are based on free agent year performances.

In an attempt to determine if in fact multi-year contracts lead to motivational losses and performance decrements among established players, Sturman and Thibodeau (2001) studied the effects of rewards on player performance. The authors examined how substantial pay raises in conjunction with new contracts impacted individual production. Subjects for this study were comprised of 33 free agents who met each of the following criteria: (1) each free agent signed a contract that provided at least a 30% raise from his previous salary, (2) the length for each free agent contract had to be at least two years, and (3) the average annual salary for each free agent had to be at least $1 million.

Offensive performance measurements consisted of batting average, home runs, runs batted in, and stolen bases. Each performance indicator was assessed for two years immediately prior to and two years immediately following the contract signing in order to detect changes in individual production. Once the data was collected, the researchers conducted a series of paired t-tests which produced results consistent with expectancy theory predictions. The study showed that player production declined in each of the four offensive measurement categories the year after the contract signing. The researchers maintained that players experienced motivational losses as a direct result of the substantial raise in salaries, which contributed to decrements in immediate post-contract performance. The research did, however, provide evidence that performance output recovered to its pre-contract level in the second year after the contract signing.

Much of the equity theory and expectancy theory research of free agent performance in Major League Baseball is limited to observational assessments of secondary performance data. Findings for these studies were based on assumptions and inferences consistent with each theory. Two concerns regarding the previous research reviewed should be noted. First, lacking from this research is actual measures of player perceptions with respect to free agency. Second, the studies utilized insufficient measurements and limited performance data.

Regarding the first point, instead of moving forward with the organizational and social behavior research, examining the nature and origin of inequity perceptions among players in baseball, researchers are still trying to answer the same fundamental questions first proposed by Lord and Hohenfeld in 1979. Nearly three decades after the inception of free agency, the academic literature with respect to free agency and performance is limited and insufficient. This can be blamed in large part on the studies themselves. The findings from prior research regarding equity theory and expectancy theory predictions on performance of free agent baseball players are contradictory and inconclusive. Of the previous six studies conducted measuring competing motivation theory predictions in conjunction with baseball free-agency, three supported equity theory predictions (Harder, 1991; Lord & Hohenfeld, 1979; Werner & Mero, 1999) and three supported expectancy theory predictions (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Sturman & Thibodeau, 2001).

While the basic framework and methodology for the previous studies was similar, the conclusions were vastly different. The present study contributes those disparities to the second concern, the researchers' selections of insufficient measurements and limited performance data. For example, of the six aforementioned studies, only one examined player performance for more than four years. The present study proposes a comprehensive assessment of free agent performance from 1976 to 2004, twenty nine years of research data.

Research that includes player perceptions with respect to free agency would be very informative. There are numerous challenges with such research, however, not the least of which is access to players. While efforts are made to conduct such research, there is also merit in examining free agent performance in Major League Baseball relative to equity theory and expectancy theory using secondary performance data using more appropriate performance measures. By reviewing the equity theory and expectancy theory studies as they relate to inequity perceptions and performance of professional baseball players, it is clear that most prior research has relied on evaluations based on many of the same one-dimensional performance measures. For example, six different traditional measurements were used in five of the six previous studies to determine effects of free agency on performance. Of the six measurements, each study used batting average and home run production to assess an individual's offensive performance from one year to the next. These statistics are great for box scores and "water cooler" office banter, however, they do not represent accurate measures of performance from which to conclude that a player's offensive production has either improved or declined.

Batting average is a one-dimensional measurement because it only measures one aspect of the game, a player's ability to hit. Batting average does not account for a player's ability to get on base, hit for power (extra bases), create runs, and win games. In fact, batting average does not correlate well with run production, which is the job of an offensive player- to produce runs for his team (James, 1985). Likewise, home runs only measure a player's ability to hit for power. Also, the home run statistic does not consider park factors. As is generally known, some ballparks are more conducive to hitting home runs than others. For example, at Coors Field in 2001, Rockies hitters slugged 58 percent of all their home runs at home, while visiting team hitters accounted for 60 percent of all their home runs at Coors Field. Comparable disparities were also evident for the 1999 and 2000 seasons (Peterson, 2002). As a result, players who play their home games at one of the more "home run friendly" ballparks, stand to benefit more in terms of home run production.

Other measurements used in previous research, runs batted in (RBI), runs scored, stolen bases, and slugging average, fall short of accurately representing a player's overall value in terms of offensive production. Those statistics too are either one-dimensional or situation dependent and thus inadequate in their ability to measure reliable player performance.

The findings of the previous research are limited and incomplete. One cannot determine what affect free agency has on performance if the measurements used to assess that performance are insufficient. Instead, one can only conclude that certain aspects of a player's performance improved or declined as a result of free agency. However, that was not the original intent of the prior research. The past research (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991; Lord & Hohenfeld, 1979; Sturman & Thibodeau, 2001; Werner & Mero, 1999) sought to explain the motivation effects of free agency on performance of baseball players, where "performance" implies a complete measure of individual production and overall value to a particular player's team.

Only measuring certain aspects of a player's performance would not prove useful in determining if free agency actually affects production. In addition, it would not be consistent with equity theory and expectancy theory predictions which suggest that an individual will be motivated to change all aspects of behavior, not just select parts. Therefore, the present study uses sabermetrics as the measurements to determine performance effects on free agent players in accordance with equity and expectancy theory predictions.

Sabermetrics

According to Bill James, well-known author, sabermetrician, and baseball theorist, sabermetrics is "the search for objective knowledge about baseball." The term is derived from the acronym SABR, which stands for the *Society for American Baseball Research* (James, 1982). It was coined by James, a Kansas baseball fanatic whose self-published *Baseball Abstracts* in the 1970s and 1980s brought sophisticated mathematical tools to the masses for the first time. James, who is widely considered to be the father of sabermetrics, began writing his unorthodox and original essays on the game of baseball in 1977 (deMause, 2002). Although originally only appealing to hardcore statisticians with a passion for baseball, his ideas have since made their way to mainstream outlets and spawned a new generation of statistical gurus determined to change the dynamics of how the game is analyzed. Lehman (1984) stated that sabermetricians "have sparked a mini-revolution as startling in its way as the adoption of the designated hitter rule by the American League a decade ago" (p. 75). It would take another decade for baseball to recognize the "mini-revolution" that Lehman (1984) referred to. Nevertheless, it happened just the same.

Among James's disciples are Billy Beane, the Oakland A's General Manager and "sabermetrician extraordinaire" on whom the best selling book *Moneyball* is based; Beane's mentor and predecessor, Sandy Alderson, who is currently the Chief Executive Officer for the San Diego Padres; Beane's one time assistants J. P. Ricciardi and Paul DePodesta, general managers for the Toronto Blue Jays and Los Angeles Dodgers respectively (deMause, 2002). Other notables working with sabermetrics include Beane's close friend, Kevin Towers, general manager for the San Diego Padres and Towers's one time assistant, Theo Epstein, the 28-year-old general manager for the Boston Red Sox who was hand picked by new owner, John Henry to challenge decades of baseball wisdom by basing important decisions in large part on objective research, or what baseball's new generation calls "sabermetrics" (Birger, 2003).

As the youngest GM in baseball history, Theo Epstein's experience as a ball player is limited to his days playing for the local high school team in Brookline, Massachusetts ("Meet Boston GM," 2002). Further, he had limited management experience and lacks a true baseball pedigree. In many baseball circles, a person possessing these qualifications or lack there of would be considered highly under-qualified with regards to such a high profile job- the general manager of one of the most storied franchises in sports history. However, many see the hiring of Epstein and others like him as an indication of things to come.

"I think what we're seeing is the beginning of something much bigger," predicts ESPN.com columnist Rob Neyer. "In five to ten years at the most, half of the GMs in baseball will have this sort of background [speaking in reference to sabermetrics]." Even Bill James himself has joined the professional ranks. He was hired by Epstein and the Red Sox as the club's senior advisor on personnel matters (deMause, 2002).

Pioneer sabermetrician Craig Wright, in his forward for Bill James's *1985 Baseball Abstract,* describes the basic concept of sabermetrics. He explains:

> "Sabermetrics is the scientific research of the available evidence to identify, study, and measure forces in professional baseball. A sabermetrician is not a statistician. Sabermetricians do *not* study baseball statistics. Sabermetricians are actually involved in research, scientific study, and the subject is baseball. The real tools of the trade fall under scientific methodology. Besides statistical techniques and applications it [sabermetrics] includes things like rules of evidence, rules of logic, testing theories and measures by internal consistency, relation to known quantities and qualities, and common sense." (p. 1)

While it is true that sabermetricians are not necessarily statisticians, a great deal of sabermetrics involves understanding how to use statistics properly and deciphering which statistics are useful for what purposes. Since statistics are often the best objective record of the game available, sabermetricians often use them in their attempt to answer objective questions about baseball, such as "which player on the Astros contributed the most to the team's offense?" or "How many home runs will Albert Pujols hit next year?"

Sabermetrics cannot logically deal with subjective judgments, such as “Who is your favorite team?” or “George Steinbrenner is bad for the game of baseball” (Grabiner, *The Sabermetric Manifesto*). Sabermetrics can provide a more objective, comprehensive measure of player performance.

As the former General Manager for the Oakland Athletics, Sandy Alderson was the first general manager in baseball to adopt the sabermetric philosophy. Mr. Alderson not only believed in this alternative approach, he built championship teams around its ideology. Like Bill James, Sandy Alderson is considered a pioneer in terms of sabermetrics and its influence in the game of baseball today. Mr. Alderson relied on sabermetrics, in his words, “quite extensively” in order to gain an edge over the competition. Alderson describes what attracted him to the sabermetric philosophy:

> “What was in my favor was the fact that I was new. I came into baseball from an entirely different world. I wasn’t bound by any sort of tradition or experience or wisdom that I had received. It’s not something I was burdened by. So I started looking around and thinking more independently and critically and it was about that time that these studies were reported and discussed. They seemed appealing to me from the standpoint of objectivity…… What struck me, what got my attention way back when, was that certain statistics could be tied directly to outcomes. Through a regression analysis, basically, you could determine which variables were most important in reaching a particular conclusion and if you could show, for example, that teams who have the highest run differential between what they score and what they give up tend to have the best winning percentages, and you start working from the proposition that you want to give up as few runs over the course of a season and you want to score as many as you can, you start looking at the probabilities of reaching those two results. In order to maximize the differential, you come up with variables that lead you to on base percentage, power, not walking anybody from a pitching standpoint. Then what you end up doing is trying to identify the players that give you the best potential and you start emphasizing certain things over others. You begin to prioritize things and rely on certain things that seem to be more indicative and predictive of the end result, winning. Batting average is not predictive of anything” (S. Alderson, personal communication, September 1, 2005).

Challenging Conventional Wisdom

The very idea of sabermetrics contradicts over a century of traditional baseball wisdom. For one to suggest that there are better ways to analyze “America’s Pastime” is considered by many as, in no uncertain terms, blasphemy. However, this notion to challenge conventional analysis did not begin with “sabermetrics” as we now know it. In fact, on August 2, 1954, an article appeared in *LIFE* magazine written by Hall of Fame Executive, Branch Rickey. In the article, Rickey, recognized by many as one of the greatest baseball management minds of all-time, mentioned the development of a new way to analyze the game of baseball based on his own examination of performance standards and their value to winning and losing games, a clear precursor to sabermetric theories and principles. Specifically, Mr. Rickey, with the help of mathematicians from M.I.T., set forth a formula that would predict how many games a team would win based on various commonly available team statistics. Rickey writes:

> "Baseball people generally are allergic to new ideas. We are slow to change. For 51 years I have judged baseball by personal observation, by considered opinion, and by accepted statistical methods. But recently I have come upon a device for measuring baseball which has compelled me to put different values on some of my oldest and most cherished theories. It reveals some new and startling truths about the nature of the game. It is a means of gauging with a high degree of accuracy important factors which contribute to winning and losing baseball games. It is the most disconcerting and at the same time the most constructive thing to come into baseball in my memory…..If the baseball world is to accept this new system of analyzing the game- and eventually it will- it must first give up preconceived ideas. I had to. The formula outrages certain standards that experienced baseball people have sworn by all their lives. Runs batted in? A misleading figure. Strikeouts? I always rated them highly as a determining force in pitching. I do now. But new facets convince me that I have overrated their importance in so far as game importance is concerned. Even batting average must be reexamined….." (p.78).

Branch Rickey used his new theories to rebuild a struggling Pittsburgh franchise that had lost at least 90 games in each of the previous four years. In 1955, though, the team improved in almost every statistical category and the Pirates' winning percentage climbed over .400. By 1958, the team was over the .500 mark for the first time in nearly a decade. Yet, the culmination of Branch Rickey's rebuilding efforts occurred in 1960, when the Pirates, led by a core of talent developed by Rickey, won the World Series over the New York Yankees (Woolner, 1997).

Sabermetrics is not a phenomenon that emerged with the arrival of Bill James and personal computers. Even before Rickey's article, scholars began inundating academic journals with sophisticated analyses of baseball. In 1952, Harvard statistics professor, Frederick Mosteller used binomial probability theory to prove that the best-of seven

World Series was an inadequate and unreliable format to determine baseball's champion. In 1956, an article in *American Statistician* proposed a method to adjust league standings based on a team's strength of schedule. Four years later, a paper was presented to the American Statistical Association titled "The Distribution of Runs in the Game of Baseball," which was the first advanced attempt to combine the probabilities of hits, walks, outs, and more into a model of how runs score (Schwarz, 2004).

In the early 1960s, a Johns Hopkins professor named Earnshaw Cook began compiling significant amounts of data that would overturn baseball's conventional wisdom. Cook then presented his findings to executives for a handful of struggling teams. Cook was largely ignored, so, in 1964, he wrote a book titled *Percentage Baseball* (Surowiecki, 2002). In the book, Cook's theories used stochastic analysis to derive performance criteria for both teams and individual players that were reasonably successful absolute measures. Many sabermetricians consider Cook's book to be the original sabermetric manuscript and the foundation for much of the baseball research that we have today. And while four decades have passed since Cook first published his findings, it was not until recently that the baseball world began to embrace sabermetrics (Schwarz, 2004).

The Application of Sabermetrics

Over the past 25 years, Bill James' work on player evaluation, player development, and baseball strategy has gone largely unnoticed. While James had a dedicated following of readers, many of whom went on to expand James's work doing ground breaking statistical analysis of their own, most baseball owners and general managers simply ignored him. In the past five years, however, all of this has changed. The new acceptance and recognition of sabermetrics can be attributed directly to the success of the Oakland Athletics, who, thanks in no small part to General Manager, Billy Beane's clever application of sabermetric insights, brought James new attention (Surowiecki, 2003). Several baseball executives had tinkered with the sabermetric method in the past. However, Beane was the first general manager to build his organization around sabermetrics (Surowiecki, 2002). Beane's extraordinary success is chronicled in Michael Lewis's best selling book, *Moneyball: The Art of Winning an Unfair Game.*

Lewis (2003) focuses on the phenomenal accomplishments of Beane, who has produced great teams despite one of the lower payrolls in baseball. Since taking over as general manager in 1999, the Athletics have compiled a remarkable record. Consider the numbers. In 1999, Oakland ranked eleventh (out of fourteen teams) in the American League in payroll and fifth in wins. In 2000, the Athletics ranked twelfth in payroll and second in wins, a feat they duplicated in 2001. In 2002, they ranked twelfth in payroll again, and first in wins (Thaler & Sunstein, 2003).

The foundation for Lewis's book is based on the acceptance of baseball's ever-changing economic landscape. Since the inception of free-agency, market demands in terms of higher salaries and longer contracts have drastically increased- allowing only the wealthier teams to contend for elite talent. In turn, this has created significant gaps between larger and smaller market teams with respect to competitive balance. Without salary cap restrictions, large market owners are able to "stockpile" premier players, leaving small market owners with fewer resources with which to build contending teams (Lewis, 2003).

Ultimately, according to Lewis (2003), a small market team's success is contingent on the general manager's ability to identify undervalued, overachieving talent. This new requisite for producing competitive ball clubs led Oakland's Billy Beane to the work of Bill James. As an assistant general manager under Sandy Alderson, Beane was indoctrinated into an alternative approach to evaluate performance void of subjective judgment regarding a player's potential and his "intangibles." With regards to the evaluation of players, Alderson said:

> "Clearly, along some point, potential has to convert into performance and somewhere along the line I think it's less worth while to rely on the potentiality of a player, and it becomes more realistic and more relevant to rely on performance of that player. When I talk about potential, I talk about the raw potential: somebody's speed, somebody's power, somebody's throwing arm, all of the things that in combination can lead to a successful player. At some point you have to be less indirect in your analysis. You look at what the player has done, look and see whether or not that is predictive of what the player will do in the future. The whole business of sabermetrics is, first and foremost, adopting statistics rather than subjective evaluation, and second, it's finding out which statistics are most

relevant to that analytical approach" (S. Alderson, personal communication, September 1, 2005).

Throughout *Moneyball*, Lewis (2003) outlines Beane's unconventional strategies for success, which are consistent with fundamental sabermetric theories and ideas created by pioneering sabermetricians such as Bill James, Craig Wright, John Thorn, and Pete Palmer. In addition, the author illustrates how these principles, adopted by Beane, changed the way that players were evaluated. By relying on objective statistical analysis, rather than instinct and subjective measurements, Beane was able to defy traditionalist baseball mentality and create a competitive team with limited financial resources. As a result, the baseball world took notice. While there is still an apparent loyalty to conventional baseball performance measures, few can argue with Beane's accomplishments.

The success of the Oakland A's has sparked some baseball insiders to reevaluate the use of statistics in analyzing performance. Up until the late 1990s, evaluating baseball talent and player performance had consisted of relying on misleading measurements of things like speed, power, hitting ability, and arm strength (Lewis, 2003). According to Quinn (2003), it's simply a matter of differing philosophies. It's the statistical methods of evaluation versus the time-honored strategies of experts who have scouted, played, and breathed baseball for decades (Thaler & Sunstein, 2003).

For example, the old guard says sign players with inherent athleticism. Ignore performance numbers. Trust gut instincts and the eye of experience. Tools are what matter most. On the other hand, the new guard says numbers- objective numbers- tell the true story, and that performance is more important than raw talent (Quinn, 2003). So, what is the verdict? If Billy Beane's success is any indication, then statistical methods will outperform the experts more often than not.

According to Quinn (2003), the idea behind sabermetrics is not just using certain prescribed methods to analyze baseball. Rather, the real purpose is to find a way to objectively analyze every facet of the game. Applying sabermetric principles means relying on probabilities and scientific standards instead of intuition and experience.

Since sabermetrics is primarily concerned with determining the value of a player, one of the most common applications of sabermetrics is the evaluation of offensive performance. According to James (1984), a team's offense is comprised of two parts: the ability to get players on base while avoiding outs and the ability to advance runners. There are various ways to measure offensive performance and several levels of complexity for different evaluation methods, yet all of them rely on measuring those two facets of offense: On-Base and Advancement.

Traditional Statistics versus Sabermetrics

One of the more traditional measures of offensive performance is batting average. A player's batting average, once baseball's gold standard of hitting ability, is considered by many sabermetricians to be a statistic of limited usefulness because it has been proven to be a poor predictor of a team's ability to score runs (Thorn & Palmer, 1990). Batting average really only measures a player's ability to hit, and while batting titles are awarded to players with the best average, victories go to the teams with the most runs (Quinn, 2003).

Thorn and Palmer (1985), in their book *The Hidden Game of Baseball*, argue against using traditional performance measures such as batting average, runs batted in, home run totals, and runs scored to evaluate a player's worth due to their extreme unreliability and their likelihood to be misinterpreted. With respect to batting average, Thorn and Palmer (1985) write:

> "The batting average remains the most hallowed statistic of baseball, despite its shortcomings: it makes no distinction between a bunt single and a home run, gives no indication of the effect of each hit, and fails to account for bases reached by walks, errors, and hit batsmen……A two out bunt single in the ninth inning with no one on base and your team trailing by 6 runs counts the same as Bobby Thompson's "shot heard 'round the world"; and no credit for fouling off 7 strikes after gaining a full count to earn a walk is given in the batting average" (pp. 17, 23).

Barry (1988) mentions that by relying on batting average alone to determine a player's performance level devalues the accomplishments of the extra-base hitters, players who draw walks, and clutch hitters. In addition, James (1985) argues that batting average is an over-weighted offensive statistic that is limited in its interpretive value.

Another traditional offensive performance measure with apparent limitations is runs batted in (RBI). RBI is an incomplete measure used to evaluate hitters that is situation dependent based on opportunities out of the batter's control. For example, the amount of runs that a player bats in depends largely on where he hits in the lineup and entirely on the number of runners on base (Thorn and Palmer, 1985). In the same way, hitting a homerun with the bases empty counts for one RBI, yet hitting a homerun with bases loaded counts for four RBI. The individual contribution of the hitter does not change. However, the difference is entirely dependent on the hitter's teammates' ability to get on base. Therefore, using RBI to evaluate individual hitters is problematic (Huckabay, 2003).

Thorn and Palmer (1985) point out other baseball performance measures that are either flawed or situation dependent. Specifically, they mention the following: (1) Stolen Bases- the amount of stolen bases a player has is not indicative of his baserunning ability; the player may have been caught stealing as often as he stole, costing his team runs (p. 27); (2) Slugging Percentage- a player's slugging percentage can be improved by a bunt single, which is not a measure of "slugging" ability (p. 24); (3) On-Base Percentage- OBP makes no distinction between a walk and a grand-slam home run (p. 25); (4) Earned Run Average- a pitcher's ERA fails to penalize a player who "retires the first two batters, watches a ground ball get booted by his shortstop, and then yields 6 home runs" (p. 29); Win-Loss Records- a pitcher's win-loss record is entirely dependent on the number of runs his team scores, thus making it an inaccurate measure of actual pitching performance (p. 28); Saves- a pitcher can earn a save without actually retiring a batter (p. 33); Fielding Percentage- this performance measure does not factor in a fielder's range (a fielder can not make an error on a ball he does not touch) (p. 33).

Thorn and Palmer (1985) maintain that many baseball statistics used to evaluate players are often misleading, inaccurate, and incomplete measures of performance. They note that baseball traditionalists rely far too heavily on a one-dimensional approach to evaluate a player's production and contribution to his team, oftentimes ignoring logic in favor of core conventional methods. In addition, most of today's performance measures are only meant to reveal parts of a player's production value. According to James (1984), (1) a "clean" measure of performance is always to be preferred to a "situation dependent" measure and (2) an accurate measure of performance is always preferred to a less accurate measure; hence the creation of sabermetrics.

Sabermetricians, such as Bill James (1984), argue that performance should be analyzed by using multi-dimensional measures that can be utilized and interpreted in terms of a ballplayer's purpose for playing baseball: to do things which create wins for his team, while avoiding those things which create losses for his team. In other words, since an offensive player's job is to create runs for his team, then a hitter's performance should be measured in terms of his ability to generate runs. Likewise, since a defensive player's job is to avoid giving up runs, then a fielder's and a pitcher's performance should be measured according to his ability to prevent the opposing team from scoring (James, 1984).

The point of sabermetrics is to make baseball statistics more explicable, not less, by reducing performance to a set of easily quantifiable "metrics" (deMause, 2002). Some of the more popular and well known metrics developed by sabermetricians are On-Base Percentage plus Slugging Average, Total Average, Runs Created, Total Offensive Production Rating, Total Pitching Effectiveness Rating, Win Shares, Total Player Rating, Major League Equivalency, Pythagorean Method, Range Factor, and Walks plus Hits per Innings Pitched.

Perhaps the most recognized and widely accepted sabermetric statistic is OPS, which stands for On-Base Percentage plus Slugging Average. OPS is frequently used by sports writers and journalists and is often referred to by sports broadcasters on television programs such ESPN's *Baseball Tonight.* According to deMause (2002), OPS has caught on with the baseball world because it is easy to calculate and it is an excellent predictor of runs scored. Specifically, OPS credits hitters with getting on base and advancing runners. OPS is calculated according to the following equation:

OPS = (H+BB+HBP)/(AB+BB+HBP+SF) + (H+2B+(2*3B)+(3*HR))/AB

H = hits

BB = walks

HBP = hit by pitch

SF = sacrifice fly

2B = doubles

3B = triples

HR = home runs

AB = at bats

Another popular sabermetric statistic is Total Average. Invented by baseball writer, Tom Boswell in the 1980s, Total Average measures a baseball player's offensive contribution from a variety of batting and baserunning events. It is determined by calculating the total number of bases that a player earns divided by the total number of outs that a player produces. Boswell (1985) explains:

> "Take Tim Raines as an example. The Expo outfielder had 137 singles, 38 doubles, 9 triples, 8 home runs, 87 walks, 2 hit-by-pitches, and 75 stolen bases. Subtract 10 bases for the 10 times he was caught stealing, leaving 426 bases. Raines also came to bat 622 times and got 192 hits, which meant that the other 430 times he made an out. Add to this the 10 times he got thrown out stealing, plus an extra out for each of the 7 times he grounded into a double play. That makes 447 outs. Now divide the bases by the outs and you get Total Average-.953 for Raines, the best in the National League in 1984" (p. 27).

Also intended to measure offensive productivity, Runs Created was developed by Bill James in 1979, in an attempt to estimate the number of runs that a batter creates for his team. Runs Created accounts for offensive productivity per plate appearance and playing time. According to James (1979), a hitter's success should be measured in terms of what he is trying to do, create runs. James (1979) in his *Baseball Abstract* wrote:

> "I find it remarkable that, in listing offenses, the league will list first-meaning best-not the team which scored the most runs, but the team with the highest batting average. It should be obvious that the purpose of an offense is not to compile a high batting average" (p. 23).

In response to what James called a "real need" in the statistical landscape of the game, he set out to develop a formula that takes the numbers of hits, walks, doubles, triples, home runs, and other offensive contributions and express them all as runs (James, 1984).

Runs Created can be calculated by the following formula:

$$\mathbf{RC} = \frac{\mathbf{(H+BB+HBP-CS-GIDP)(TB+.26(BB-IBB+HBP)+.52(SH+SF+SB))}}{\mathbf{AB+BB+HBP+SH+SF}}$$

H = hits

BB = walks

HBP = hit by pitch

SF = sacrifice fly

AB = at bats

CS = caught stealing

GIDP = grounded into double play

TB = total bases

IBB = intentional walk

SH = sacrifice hits

SB = stolen bases

The Runs Created metric is highly correlated with a team's total run production. In other words, one could plug actual numbers from past seasons into the equation and determine the number of runs a team scored for any given year. In fact, Runs Created has been proven to equal the actual number of runs a team scores in a season to within 5% (James, 1984). In 2003, the Atlanta Braves led the National League in runs scored. They also had the most runs created. That same year, the St. Louis Cardinals, Colorado Rockies, and Houston Astros were second, third, and forth respectively in each category.

James also invented the Pythagorean Formula which can predict a team's winning percentage by taking its runs scored squared and dividing by the sum of its runs scored squared and its runs allowed squared. The concept is based on what James (1984) calls one of the "known principles of sabermetrics": there is a predictable relationship between the number of runs a team scores, the number they allow, and the number of games they will win. Empirically, the Pythagorean Formula correlates fairly well with how teams actually perform (Thorn & Palmer, 1990). In fact, in his book *Moneyball*, Michael Lewis (2003) describes how Paul DePodesta, the then assistant general manager of the Oakland Athletics, used James's formula to predict, with significant accuracy, how many runs the A's would need to score for the 2002 season in order to make the playoffs. Lewis writes:

> "Before the 2002 season, Paul DePodesta had reduced the coming six months to a math problem. He judged how many wins it would take to make the playoffs: 95. He then calculated how many more runs the Oakland A's would need to score than they allowed to win 95 games: 135. (The idea that there was a stable relationship between season run totals and season wins was another Jamesean discovery.) Then, using the A's players' past performance as a guide, he made reasoned arguments about how many runs they would actually score and allow. If they didn't suffer an abnormally large number of injuries, he said, the team would score between 800 and 820 runs and give up between 650 and 670 runs. From that

> he predicted the team would win between 93 and 97 games and probably wind up in the playoffs." (The A's wound up scoring 800 and allowing 653) (p. 124).

Two metrics designed to evaluate hitting and pitching production are Total Offensive Production Rating (TOPR) and Total Pitching Effectiveness Rating (TPER). Developed by Hitzges and Lawson in 1994, TOPR and TPER account for a player's total production performance based on total bases earned and lost. In addition, TOPR and TPER are tools that determine both hitting and pitching performances by using a single measurement. In other words, TOPR and TPER allows offensive and pitching production to be compared by the same performance standard based on each player's role: a hitter's role is to produce bases and minimize outs, while a pitcher's role is to generate outs and minimize bases (Hitzges and Lawson, 1994).

In the same way, Pete Palmer's Total Player Rating is a metric used for measuring a baseball player's production value. This particular measurement allows players to be compared against each other from different teams, different leagues, and across different eras. The concept is based on based on assigning run values to various aspects of hitting, pitching, and fielding performance using linear weights.

Win Shares, developed by Bill James in 2002, is another metric that evaluates players based on complete performance measures. Specifically, Win Shares assigns players fractions of their team's wins based on individual hitting, pitching, and fielding performance. Win shares differs from other player rating metrics in that it is based on team wins, not runs. Win Shares is an exhaustive statistic that sums up player's contribution to his team in a single number.

According to James (2002), Win Shares was invented as a simplistic way to compare players; players from different positions, players from different teams, and players from different eras. In his most recent book of the same name, *Win Shares,* Bill James explains his rationale for developing his newest sabermetric measurement. James writes:

> "For many years, I have wanted to have a system to summarize each player's value each season into a simple integer. Willie Mays' value in 1954 is 40, in 1955, 40, in 1956, 27, while Mickey Mantle in the same three years is 36, 41, 49. If we had an analytical system *in which we had confidence*, and which delivered results in that simple a form, it would open the door to researching thousands of

> questions which are virtually inaccessible without such a method. It would reduce enormously the time and effort required to research other questions, which can be accessed by other methods, but only with great difficulty." (p. 3).

While the actual Win Shares methodology is somewhat complex, the results are groundbreaking (Neyer, 2002). The formula itself credits players proportionally based on their statistics. A Win Share is actually the number of wins contributed by a player multiplied by three. Conversely, the formula credits a team with three win shares for each win. For example, if a team wins 100 games in a season, the players on that team are credited with 300 Win Shares (James, 2002). According to James (2002), the three to one ratio is important in order to provide a meaningful distinction between players.

There are three types of Win Shares: hitting, fielding, and pitching. In general, hitting contributions receive 48% of the Win Shares, 35% are assigned to pitchers, and 17% are assigned to fielders. However, those percentages can vary based on individual team strengths and weaknesses (James, 2002). In his book *Win Shares*, James introduces a short-form method for calculating Win Shares as well as a long method. The short form method is represented by the following equation:

$$\mathbf{WS} = \frac{\mathbf{RC - (Outs/12)}}{\mathbf{3}}$$

RC = Runs Created

The long method of calculating Win Shares is a tedious and intensive process. The long method is based on identifying what James refers to as "marginal runs." Marginal runs are all runs scored by a team minus one-half the league average and all runs allowed by a team less than one and one-half times the league average. In addition, this method involves determining the ratio of Win Shares credited to the offense and defense, which is based on park-adjusted runs scored and allowed. Then, Runs Created are calculated as well as outs made by each hitter. "Claim points" are used to divide up offensive and defensive win shares. Finally, individual win shares are determined for each player on the team.

In an effort to translate minor league data into major league performance, Bill James created a metric called MLE which stands for Major League Equivalency. By adjusting for the run environment, caliber of competition, and park factors, James was able to estimate how minor league players would perform at the major league level given the same production. MLEs are not a prediction of what a player will do, just a translation of what the major league equivalence of what the player actually did. However, MLEs, like major league statistics, have strong predictive value (James, 1985). In reference to MLEs, James (1989) wrote, “In my opinion, this is the most important thing I’ve learned in my years of studying sabermetrics in terms of its potential ability to help a baseball team” (p. 475).

Most sabermetric statistics are objective offensive measures of performance. A few metrics do, however, measure some of the defensive aspects of the game. An example is Range Factor. Range Factor is a metric created to quantify a player’s fielding ability, beyond just errors. It is calculated by multiplying assists and putouts by nine, then dividing by the number of innings played (Quinn, 2003).

Another metric used to measure non-offensive performance is WHIP, which stands for walks plus hits per innings pitched. WHIP is a sabermetric tool used to measure a pitcher’s ability to prevent hitters from getting on base. WHIP is another “mainstream” sabermetric statistic that is widely used and recognized throughout baseball. Most newspaper box scores now print a pitcher’s WHIP in addition to earned run average and strikeouts.

What is different about today? Does the difference between the old statistics and the new statistics matter? T. J. Quinn, a sports writer for the *New York Daily News*, has an interesting answer. Quinn (2003) writes:

> “It’s like physics. In the late 17th century, Isaac Newton laid out his laws of gravity, and for the most part those rules work for the average person today. Then, in the early 20th century, Albert Einstein came along and proved that Newton’s ideas about gravity missed the point (the point being relativity). But it was the sort of difference that mattered only to scientists. If you want to know why space and time bend, it matters. If you’re someone who wants to drop a water balloon off a building, it doesn’t” (p. 3).

According to Gillette (1993), the familiar traditional measures of player performance- batting average, home runs, runs batted in, wins, losses, earned run average, and strikeouts- have merit, or they wouldn’t be universally known throughout baseball. However, Gillette argues that the traditional statistics have not evolved with the game of baseball. Gillette writes:

> "What's wrong with the old familiar stats is that they haven't changed as the game has changed. They still have value, but newer stats are needed to describe and analyze the way the game is played today. Everything else in life changes over time, so why should baseball- or baseball statistics, for that matter- remain frozen? ……Scholars, doctors, lawyers, politicians, teachers, stock brokers, mechanics, and many others play largely the same roles in society today as they did 75 years ago. Yet their training isn't the same, their tools are different, the way they approach their jobs has changed, and the amount they get paid has increased manifold. There is no reason to assume that similar changes haven't affected our national pastime. Just as our language has altered and our sciences have progressed, so, too, must our understanding of how baseball is played. Baseball statistics are the measure of the game, and the 'new' statistics are simply an attempt to assess the modern game more accurately" (p. v).

Bill James (1989) wrote, "The evolution of statistical information about baseball, progressing nicely from about 1869 to 1955, was frozen solid for a generation afterward" (p. 453). However, with the emergence of sabermetrics, statistical analysis of baseball performance data is increasing exponentially. As more and more baseball insiders begin to rely on sabermetric principles to strategize and evaluate performance, there could soon be a paradigm shift. After all, in less than a decade, sabermetrics has gone from relative obscurity to mainstream recognition (Beradino, 2003).

Opposition to Sabermetrics

Consistent with any objective evaluations of performance, there are limitations and criticisms of sabermetrics. In fact, the more mainstream sabermetrics become, the more critics and skeptics will surface. One could not expect to reject over a century of traditionalist mentality about America's Pastime and be received with open arms, neither do sabermetricians. Sabermetrics is by no means an overnight phenomenon. It has been over forty years since a mechanical engineer from Baltimore named Earnshaw Cook introduced his vision of how baseball should be analyzed and managed. As the result of a lunchtime conversation with a Yale psychology professor concerning the productiveness of the sacrifice bunt, Cook embarked on a three year journey to present a formal analysis of baseball. His analysis suggested that no one had ever known the true percentages of the game, and if anyone did know them he could manage nearly any team to success. As with many innovations, the first edition of *Percentage Baseball* met with bitter criticism and controversy. In regards to Cook's book, *The Sporting News* writer James Gallagher wrote "I do not understand how the Baltimore mathematicians reached their controversial conclusions, but in my book any generalizations about baseball have to be wrong" (Schwarz, 2004).

Even Cook himself understood the difficulty of introducing his ideas to a skeptic and unwilling audience. Cook (1966) wrote the following in his forward to *Percentage Baseball*:

> "The general complacency of baseball people-even those of undoubted intelligence-toward mathematical examination of what they regard properly and strictly as their own dish of tea is not too astonishing. I would be willing to go as far as pretending to understand why none of four competent and successful executives of second-division ball clubs were most reluctant to employ probabilistic methods of any description ...... but they did not even want to *hear* about them" (p. xi).

It would take another thirteen years for another book to be published defying conventional baseball logic. In 1977, Bill James self-published a book titled *1977 Baseball Abstract: Featuring 18 Categories of Statistical Information That You Just Can't Find Anywhere Else*. Unlike Cook's Book, James' did not stir up a controversy. This was largely in part because almost no one bought it. The book sold only seventy five copies. James followed up the failure of his first book with another the following year titled *1978 Baseball Abstract: The 2nd Annual Edition of Baseball's Most Informative and Imaginative Review*. It sold only 250 copies (Lewis, 2003).For the next ten years James published annual books in the series of abstracts, each garnering more attention and inviting more criticism. In addition, others began to write and publish their own theories and analytical analyses of the game, some more popular than others (Schwarz, 2004).

Most criticisms of sabermetrics come from baseball insiders, fans, and the media. Critics of sabermetrics suggest that far too much emphasis is placed on mathematical formulas and advanced statistical equations. Traditionalists maintain that it is impossible to compute the human element involved in the game, such as strategy, player management practices, or player engagement. Further, those opposed to the sabermetric movement argue that the counting statistics such as, runs batted in, home runs, batting average, stolen bases, etc. are exact and incapable of misinterpretation (Albert & Bennett, 2003).

While sabermetrics is not an exact science, it does have its place in the game. The purpose of sabermetrics is not to replace traditional statistics all together. Also, sabermetrics does not attempt to account for the intangible and unpredictable aspect of human behavior. What it does is provide a better evaluation of player performance while offering a more comprehensive look at the intricacies of the game that traditional counting statistics do not measure. In an objective baseball world, one could potentially conceive of a perfect union between traditional wisdom, sabermetric measurement, and old fashioned "gut-instinct." For now, one will just have to settle for controversy.

Justification for the Use of Sabermetrics

With respect to the current study, sabermetrics offers a multi-dimensional method of assessing player performance superior to the one-dimensional traditional measures used in previous studies. As research has proven, the old and new statistics can paint vastly different pictures of a player (Bialik, 2003). For instance, when assessing the 2003 offensive performance of White Sox designated hitter, Frank Thomas, the traditional measurement of batting average reveals that the likely future hall-of-famer hit just .267, 43 points off his career mark, indicating a decline in offensive production. However, by the measure of OPS, Thomas returned to his superstar form of the late 1990s, ranking 6th in the American League.

The utility of equity theory and expectancy theory is to accurately predict performance. If performance is not measured correctly, then the predictions are not reliable and should not be used to make knowledgeable and informed conclusions as to the motivational force of certain players. Since the validity of this study depends on accurate assessments of performance, it is reasonable to infer that consistent multi-dimensional measurements should be used. The current study utilizes sabermetrics as a measurement tool to determine various aspects of player performance.

Specifically, this study used three sabermetric measurements to assess performance effects of free agents: OPS, Runs Created, and Win Shares. These particular sabermetric measures will account for all offensive aspects of the game without compromising the value of individual production. OPS measures a hitter's propensity to get on base and his ability to hit for power and average, Runs Created measures a player's total offensive contribution in terms of runs, and Win Shares measures a player's contribution to his team in terms of wins.

According to James (1987), there are four basic criteria on which the usefulness of a statistic should be judged: 1) importance- does the statistic measure something significant to winning?, 2) reliability- is it truly representative of ability?, 3) intelligibility- can the average baseball fan understand this information?, and 4) construction- can the elements be combined in order to be cohesive? Ultimately, the predictive value of sabermetrics is what makes them superior to other performance measures. While predictions are admittedly imperfect, there are ways of increasing their accuracy by relying on the proper statistics (Gillette, 1993). For example, both OPS and Runs Created have a strong positive correlation with the number of runs teams score. In fact, according to the research (Birnbaum, 1999; Blau, 1999; James, 1984) if you add the number of Runs Created estimates for every member of a team, they accurately predict, with little error, both the Runs Created estimate for the team and the actual number of runs the team scored. In addition, Runs Created estimates tend to be in line with runs and RBI totals for individual players.

In order to better understand the impact of free agency on performance, the current study examined competing hypotheses of equity theory and expectancy theory predictions of player performance as determined by sabermetrics. Ultimately, this study seeks to answer 1) whether or not free agents increase productivity as a result of perceived under-reward and 2) whether or not free agents decrease performance as a result of over-reward. By supporting equity theory predictions, this study suggests that a significant number of players will attempt to reduce inequity by decreasing productivity in their option year as a result of under-reward and improving productivity in the year following their option year due to over-reward. However, by supporting expectancy theory predictions, this study proposes that option year productivity will be superior to previous years' production in hopes of earning a more lucrative contract deal, and post option year player productivity will decline as the result of signing a new contract. The following chapter will outline the methods used to determine which theory's predictions hold true.

CHAPTER III

METHODOLOGY

The current study examined free agency in Major League Baseball and its impact on player productivity. Multi-dimensional metrics were used in order to provide comprehensive measurements of player performance. The findings provide a determination as to which organizational behavior theory, equity theory or expectancy theory, (1) is more consistent with actual performance results and (2) is best suited to frame future research. Chapter 2 provides a review of past studies that have tested equity theory and expectancy theory predictions of performance, and presents sabermetrics as an alternative and superior means of assessing player productivity. This chapter combines the components discussed in Chapter 2 and outlines the methodological procedures used in this research study to examine the effect that free agency, both anticipated and experienced, has on overall productivity for major league players.

The study was comprehensive in that it examined performance data over a 28 year period. In addition, it is one of the first academic research studies to use sabermetrics exclusively to assess performance. This potentially ground breaking study provides a foundation for future research involving sabermetrics. The following sections outline the research methodology used in this study.

Selection of Subjects

Subjects for this study consisted of Major League Baseball free-agents who signed multi-year contracts of at least two years or more with a their current team or another major league franchise between the years of 1976 and 2003 (n = 234). In order to qualify for inclusion, players must have had a minimum of 250 at-bats in each of the three individual years being examined: pre-option year, option year, and post-option year. The minimum number of at-bats standard helps ensure that results are not skewed due to incomplete or limited performance data. This number of at-bats roughly constitutes half of a season's worth of production. Also, in order to be eligible for this study, players cannot play for more than one team in any season between their pre and post option years.

Measurements

The study examined secondary performance data of Major League Baseball players using three categories of sabermetric measurement. The first measure used was On-Base Percentage plus Slugging Average (OPS). OPS is a measure of a player's ability to get on base (on-base percentage) and the ability to advance runners (slugging average). This metric is now considered to be a mainstream statistic given that it is easy to calculate and is known to be an excellent predictor of runs scored. OPS is calculated by simply adding a player's on-base percentage to his slugging average.

OPS = (H+BB+HBP)/(AB+BB+HBP+SF) + (H+2B+(2*3B)+(3*HR))/AB

H = hits

BB = walks

HBP = hit by pitch

SF = sacrifice fly

2B = doubles

3B = triples

HR = home runs

AB = at bats

The second measure used in the study was Runs Created (RC). This metric was developed by Bill James as a method for taking a hitter's component offensive contribution and figuring out how many of his team runs he was personally responsible for. Runs Created is thought of by many sabermetricians as the definitive evaluation metric because it measures a player's true purpose in playing baseball, doing things to create runs for his team while avoiding things that create outs. Further, runs created has proven to be an excellent predictor of total runs scored for each team Adding the total number of runs created for each player on a team usually predicts, with reasonable accuracy, a team's total number of runs scored in a season.

Runs Created attempts to quantify offensive production in terms of an individual player's contribution to runs scored. With relation to the actual statistical formula, strong emphasis is placed on a hitter's ability to get on base via hits or walks. In addition, a player is rewarded for advancing bases through steals or extra base hits. It stands to reason that a player can not score unless he is on base, and the closer that player is to home, the greater his chances are for scoring. This particular metric also penalizes players who do things that prevent themselves or their teammates from scoring, such as grounding into double plays or getting caught stealing. The following equation represents the Runs Created measurement:

$$RC = \frac{(H+BB+HBP-CS-GIDP)(TB+.26(BB-IBB+HBP)+.52(SH+SF+SB))}{AB+BB+HBP+SH+SF}$$

H = hits

BB = walks

HBP = hit by pitch

SF = sacrifice fly

AB = at bats

CS = caught stealing

GIDP = grounded into double play

TB = total bases

IBB = intentional walk

SH = sacrifice hits

SB = stolen bases

The third sabermetric measure used in this study was Win Shares (WS). Also developed by Bill James, Win Shares measures a player's contribution to his team in terms of wins. Aside from being the newest metric used in this study, Win Shares is also the most exhaustive. Although the Win Shares methodology is complex, its result is simple: one number that allows comparisons among infielders, outfielders, catchers, starters, and relievers between different teams and across different eras. The process begins with determining the number of games a team won and assigning credit to players, proportionally based on their statistics.

In his book *Win Shares*, James introduces a short-form method for calculating Win Shares as well as a long method. The short form method of Win Shares is:

$$\mathbf{WS} = \frac{\mathbf{RC - (Outs/12)}}{\mathbf{3}}$$

Pitching and defense contributions receive 52% of the Win Shares and hitting contributions receive 48% of the Win Shares. This metric also adjusts for ballpark effects for hitters. As noted in the review of literature, it has been proven more difficult to score runs in certain parks, such as Dodger Stadium, than others, such as Coors Field, due to conditions such as altitude, fence depth, and the overall size differential of today's stadiums (James, 2002). Win Shares accounts for this effect.

Win Shares is a primary measure of contribution and not necessarily talent. Players who "over-perform" in one year receive full credit for their efforts toward winning games for their team, regardless if they are never able to match that level of performance again. For example, in 1996, Brady Anderson of the Baltimore Orioles hit fifty home runs, a remarkable feat for any player. However, from 1988 to 1995, Anderson averaged only seven home runs per year, and from 1997 to the last year of his career in 2002, he averaged only twelve. Regardless of Anderson's one year wonderment, under the Win Shares system of player evaluation, players are only measured by what they do on the field, not what the should or should not be able to do based on talent and five-tool potential. Baseball traditionalists tend to evaluate players based on scouting reports and situation dependent statistics, opening the door to misjudgment and subjective error. Win Shares offers an objective approach to assessing player productivity.

Collectively, OPS, Runs Created, and Win Shares offer a more in-depth and complete assessment of player performance than the traditional statistics. Traditional statistics such as batting average and runs batted in break down offensive production into individual ability encompassing basic categories of hitting, running, and throwing. Sabermetric measures evaluate offensive performance based on a more inclusive approach meant to measure not only a player's individual ability, but also his collective value in terms of his contribution to helping his team score runs and win games.

Stevens (2002) suggests that in order to obtain meaningful multivariate quantitative data that provides a more complete and precise understanding of the phenomenon under study, researchers should rely on the most comprehensive measures available. Since the purpose of this study was to determine how free agency impacts players' overall performance, it was appropriate to use comprehensive sabermetric measures.

Pilot Study

A pilot study was conducted in order to provide initial validation of the use of alternative measures of performance, sabermetrics. Of particular interest to the study was answering questions such as: Are traditional measurements and sabermetric measurements interchangeable in their assessments of player productivity? Are there inconsistencies between the two statistical measurements with respect to how performance is translated? In order to answer those questions, the study examined how players performed according to traditional measures of batting average, home runs, and runs batted in and compared that information with how players performed according to sabermetric measures of OPS, Runs Created and Win Shares over a nine year period from 1990-1993 and 1995-1999, excluding 1994, the year of the player work stoppage.

The top twenty-five finishers in each of the three traditional categories were compared with the top twenty-five finishers in each of the three sabermetric categories in order to determine whether players who performed well according to traditional measures also performed well according to sabermetric measures. Nine comparisons in each of the nine seasons combined with three cumulative comparisons for each year along with nine cumulative comparisons for the total nine seasons resulted in 117 total comparisons between traditional and sabermetric performance measurements. The 117 comparisons were then used to summarize the relationship between each performance measurement as a whole and each of the six individual measures. Comparisons were quantified in terms of percentages of players who were among the top twenty-five finishers of traditional statistics yet not among the top twenty-five finishers of sabermetric statistics. In all, 2,025 traditional statistic leaders were compared with 2,025 sabermetric statistic leaders for a total of 4,050 players.

The results from the pilot study indicated that even though traditional statistics and sabermetrics purport to measure the same outcome, individual performance, there can be substantial differences in terms of assessing a player's actual productivity. Examination of the data comparisons in the pilot study illustrated that a disproportionate relationship between traditional wisdom and sabermetric philosophy does exist. For example, when assessing the 1996 offensive production of Houston Astros first baseman, Jeff Bagwell, traditional statistics show that the seven time all-star and 1994 National League Most Valuable Player ranked just 31^{st} in batting average, 34^{th} in home run production, and 14^{th} in runs batted in, below average productivity at best for the likely future hall-of-famer. However, according to sabermetric measurements, Bagwell out-performed most of the league by ranking 12^{th} in OPS, 6^{th} in Runs Created, and 1^{st} in Win Shares. Likewise, when evaluating the 1999 offensive performance of New York Yankees shortstop, Derek Jeter, traditional measures show that the World Series Most Valuable Player ranked just 65^{th} in home run production and 50^{th} in runs batted in. Yet, according to sabermetric measures, Jeter finished 4^{th} in Runs Created, and 2^{nd} in Win Shares.

When trying to find cumulative disparities between traditional and sabermetric measurements for the entire decade of the 1990s, one need look no further than seven time National League Most Valuable Player, Barry Bonds. According to traditional statistics, Bond's average ranking for the 1990s was 63^{rd} in batting average, 14^{th} in home runs, and 20^{th} in runs batted in. Based on those numbers alone, one might have a hard time recognizing those rankings as belonging to one of the greatest hitters in the history of the game. However, sabermetrics paint a vastly different picture of Bonds's production in the 1990s. For the decade, Bonds's average ranking was 4^{th} in OPS, 2^{nd} in Runs Created, and 2^{nd} in Win Shares. Both measurements considered the same offensive output from exactly the same years, yet each translates into a different version of performance.

The study concluded that this contradiction is potentially problematic given that so many factors are dependent on performance. In baseball, accurate and objective assessments of performance are essential to organizational success. How players are evaluated and the result of those evaluations determine player salaries, free agent negotiations/signings, if and when an amateur is drafted, on-field strategies, trades, call-ups, releases, and other essential aspects of the game. The results of the pilot study support the premise that sabermetrics provide a multi-dimensional, comprehensive assessment of player performance.

Procedures

The collection of secondary data for this study was accomplished in three phases. In the first phase, a sample was drawn from a population of Major League Baseball Players active sometime between 1976 and 2003. Selection of subjects was based on players' free agent status, number of at-bats, and length of free agent contracts. Free agent filings were obtained via the 1977-2004 editions of *The Sporting News Guide*. From that list of free agents, those who did not meet the predetermined criteria for contract length, team exclusivity, and number of at-bats were eliminated from the study. The remaining free agents make-up the sample used for statistical analysis.

Once the sample of free agents was determined, the second phase involved recording the sabermetric data of OPS, Runs Created, and Win Shares for each of the subjects in (1) the year prior to the option year, (2) the actual option year, and (3) the year following the option year or the first year of a player's new contract.

In the third phase, option year sabermetric performance data for qualified free agents was compared with (1) pre-option year performance and (2) post-option year performance in order to detect improvements or declines in productivity. The results should be consistent with either expectancy theory predictions- (1) option year performance will improve compared to pre-option year performance and (2) post-option year performance will decline when compared to option year performance, or equity theory predictions- (1) option year performance will decline when compared to pre-option year performance and (2) post-option year performance will improve when compared to option year performance.

Research Design

This research represents a longitudinal study assessing variations in performance associated with inequitable perceptions initiated by the expectancy and realization of free agency. Statistical significance of the three dependent variables (OPS, Runs Created, and Win Shares) was determined by repeated measures multivariate analysis of variance

(MANOVA) and multivariate analysis of covariance (MANCOVA), to test if performance differences exist within the subjects before and after the independent variable, free agency. The MANOVA and MANCOVA were computed to test the two null hypotheses stating that there will be no significant differences in performance with respect to pre-option year/option year and option year/post-option year comparisons.

Stevens (2002), mentions four statistical reasons for preferring a multivariate analysis: (1) multivariate analysis controls for inflated overall type I error rate, (2) multivariate analysis incorporates the important information of the correlations among the variable or subscales right into the statistics, (3) subscale scores may cancel out an overall significant difference but the multivariate analysis reflects the significant differences of individual subscales, and (4) small differences on several of the variables may combine to produce a reliable overall difference, making multivariate tests more powerful.

A repeated measures design allows for the study of a phenomenon across time. Pedhazur (1982), states that this design is particularly important in studies involving changes in learning, fatigue, forgetting, performance, and aging. According to Thomas and Nelson (1996), there are some problems associated with repeated measures designs. Two problems mentioned by the researchers in particular, with the potential to adversely affect this study, include (1) practice effects and (2) fatigue. Practice effects refer to the possibility of subjects performing better at tasks (dependent variables) as a result of repeated trials in addition to the treatment. Specific to this study, players may increase productivity from pre-option year to option year simply as a result of natural progression due to increased number of at-bats and not as a result of inequity perceptions associated with free agency. Fatigue refers to subjects' decline in performance over time. Specific to this study, player performance may be more indicative of factors contributing to fatigue such as age or injury and less an indication of free agency's affect on player motivation and performance. According to a study conducted by Schulz, Musa, Staszewski, and Siegler (1994), the average Major League Baseball player's production begins to decline at age 28.

While practice effects may not be controlled for in this particular study, it does become a limitation of the research worth noting. However, in order to control for the potential problem of fatigue, this study included a covariate. Subjects' age was used as the covariate. By controlling for age, this study sought to account for declines in performance due to fatigue and normal degeneration of skills. According to Stevens (2002), the inclusion of covariates will result in greater reduction in error, ultimately improving the chances of rejecting a null hypothesis that is really false.

Another aspect of the game of baseball that could potentially affect offensive production is a player's team. While sabermetrics only examines individual productivity, the team dynamic could still factor in to how individuals perform. For example, players who play on winning teams who have a legitimate chance to make the playoffs and win the World Series may be more motivated to play at a higher level than a player on a weaker team, regardless of the player's free agent status or inequitable perception of rewards. In order to minimize these effects on the results of this study, a covariate assessing team winning percentage was used. This covariate was used to separate "winning teams" from "non-winning teams" in each of the three levels of the independent variable: pre-option year, option year, and post-option year. "Winning teams" were determined to be those who had a winning percentage above .550. Teams with winning percentages at or below .550 were considered "non-winning teams."

Research Questions

This section outlines the research questions upon which the equity theory and expectancy theory hypotheses were formulated, taking into account the induction of covariates.

General Research Questions:

> Does free agency affect Major League Baseball player performance? If so, then how?
>
> Statistical Null Hypothesis: Free agency does not affect Major League Baseball player performance.
>
> Equity Theory Hypothesis: Free agency negatively affects player performance in terms of initial declines in productivity as a result of perceived inequity.
>
> Expectancy Theory Hypothesis: Free agency positively affects player

performance in terms of initial improvements in productivity as a result of perceived inequity.

Specific Research Question One:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares from players' pre-option year to option year.

Equity Theory Hypothesis: Offensive productivity will decline in the option year when compared to the previous (pre-option) year.

Expectancy Theory Hypothesis: Offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Specific Research Question Two:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year.

Equity Theory Hypothesis: Offensive productivity will improve in the first year of a new contract when compared to the previous (option) year.

Expectancy Theory Hypothesis: Offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

Specific Research Question Three:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of age?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of age.

Equity Theory Hypothesis: Offensive productivity will decline in the option year when compared to the previous (pre-option) year.

Expectancy Theory Hypothesis: Offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Specific Research Question Four:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of age?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of age.

Equity Theory Hypothesis: Offensive productivity will improve in the first year of a new contract when compared to the previous (option) year.

Expectancy Theory Hypothesis: Offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

Specific Research Question Five:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of team winning percentage?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of team winning percentage.

Equity Theory Hypothesis: Offensive productivity will decline in the option year when compared to the previous (pre-option) year.

Expectancy Theory Hypothesis: Offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Specific Research Question Six:

Are there significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of team winning percentage?

Statistical Null Hypothesis: There are no significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of team winning percentage.

Equity Theory Hypothesis: Offensive productivity will improve in the first year of a new contract when compared to the previous (option) year.

Expectancy Theory Hypothesis: Offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

Data Analysis

The performance data for all qualified subjects was analyzed using the Statistical Package for the Social Sciences (SPSS). The data was used to investigate each of the equity and expectancy hypotheses. An alpha level of 0.05 was used for this statistical test. In addition to the multivariate tests, univariate analyses were conducted in order to assess significant differences between the different free agent periods. The univariate tests were useful in interpreting the results and determining which organizational behavior theory holds true.

Statistical analysis of sabermetric measures of Major League Baseball free agent performance revealed the effects of free agency on player productivity. Significant disparities in performance between pre-option year and post-option year offensive production suggest that free agency influenced changes in player productivity. The findings for the current study support one of two competing theories of worker motivation. Significant performance decline by players in their option year when compared to pre-option year and post-option year productivity would be consistent with equity theory predictions. Improvements in offensive productivity by players in their option year when compared to pre-option year and post-option year performance would be consistent with expectancy theory predictions. Discovering which organizational behavior theory holds true for Major League Baseball free agents will prove advantageous for industry leaders in professional baseball and academic researchers alike.

CHAPTER IV

RESULTS

The purpose of this study was to examine the impact of free agency on Major League Baseball player performance. Performance was assessed using sabermetrics to provide a comprehensive measure of overall offensive productivity. Two competing theories of organizational behavior serve as the framework for this study. Both equity theory and expectancy theory were developed to predict worker performance under conditions of inequity in terms of under-reward and over-reward. In conjunction with both theories, this study assumed the following: (1) that players in the final year of their contracts, just prior to becoming eligible for free agency, perceived inequitable conditions of under-reward, and (2) that players who signed a new multi-year free agent contract perceived inequitable conditions of over-reward in the first year of a new contract. The previous chapter postulates that the findings for this study will be consistent with either equity theory or expectancy theory predictions.

This chapter includes the results and discussion of the analysis of the data. The three dependent variables, OPS, Runs Created, and Win Shares were examined individually at three separate time periods in relation to the independent variable, free agency. Also, covariates age and team winning percentage were incorporated into this study in an attempt to control for specific factors thought to impact individual player performance. The findings for this study are presented in the following four sections: (1) Descriptive Findings, (2) Data Analysis, (3) Evaluation, and (4) Summary.

Descriptive Findings

A total of 234 different cases were analyzed for this study. Subjects were comprised of 188 different Major League Baseball players active sometime between 1976 and 2004. Thirty five players qualified at least twice for the study. Each player qualified based on his free agent status, the signing of a multi-year contract, and a predetermined at-bat minimum (n = 250) in each of the years being examined: pre-free agency, free agent year, and post-free agency. A total of 177 players changed teams at some point during the pre- and post-free agent years. Only 57 players remained with the same team throughout each of the three years. Fifty players, who otherwise qualified for the study based on their free agent status and number of at-bats, were eliminated because they played for two or more teams in a single season at some point during the pre- and post-free agent years. In-season player movement complicates the interpretation of player motivation and inequity perception as it translates into individual offensive performance.

Data for two of the dependent variables, Runs Created and Win Shares, was normalized for each player. For instance, Runs Created metrics were divided by players' number of at-bats and Win Shares metrics were divided by players' number of games played for each season. The average number of at-bats and games played for the subjects remained largely the same throughout the three time periods being examined. On average, players played in 131 games and totaled 467 at-bats in their pre-option year. In their option year, players averaged 134 games and 473 at-bats. During the post-option year, players averaged 131 games and 469 at-bats.

The average age for the free agents in this study was 31. There were 188 (80.3%) first time free agents with an average age of 30, 35 (14.9%) second time free agents with an average age of 33, and 9 (3.8%) third time free agents with an average age of 36.

Besides age, another factor that could potentially affect player performance is team winning percentage. By controlling for the "team" dynamic, this study attempted to account for significant changes in winning that could possibly influence player motivation and performance. A "winning team" was considered to be one having a winning percentage above .550. As such, only 82 of the 234 players (35%) played on a winning team in their pre-option year. That number rose slightly in players' free agent year in that 99 players (42.3%) played on a winning team. However, according to the statistics, most free agents who signed new multi-year contracts did so at the cost of winning. Only 68 of the 234 free agents in this study (29%) played on a winning team in their post-option year.

Data Analysis

The results of the statistical analysis of the research data for this study are presented in the following sections. The affect of free agency on player performance was analyzed separately according to each of the three dependent variables, OPS, Runs Created, and Win Shares. The interaction effects between the independent variable and dependent variables were examined with and without the covariates age and team winning percentage. Based on the findings, each proposed research question and hypothesis will be answered. The purpose of this section is to (1) determine whether free agency significantly impacts player performance, and, if so, (2) provide evidence to support either equity theory hypotheses or expectancy theory hypotheses.

OPS

The first component of sabermetric analysis used to assess the effect of free agency on player performance was OPS. The mean OPS for players in their pre-option year was .78359. That number rose the following year, in the players' actual option year, to a mean of .79460. Following the signing of a new multi-year contract, however, players' mean OPS fell to .77340. These results can be seen in Table 1.

Table 1

Mean OPS Values for Players Before and After Free Agency

	Mean	Std. Deviation	N
Pre-OPS	.78359	.106346	234
Option OPS	.79460	.114882	234
Post-OPS	.77340	.112992	234

Multivariate analysis of variance (MANOVA) with repeated measures was conducted to determine OPS performance differences across the three free agency time periods: the pre-free agency year, the free agency year, and the post-free agency year. The MANOVA results indicated that there were significant differences (Wilks' $F(2, 232) = 6.089$, $p<.01$) in the OPS performance means among the three free agent time periods. Table 2 shows the output from the multivariate tests.

Follow-up univariate analysis, reported in Table 3, revealed within-subjects OPS performance comparisons between pre-option and option years and option and post-option years. Differences between pre-option year and option year OPS were not significant, *F*(1, 233)=3.287, *p*=.071. However, differences between option year and post-option year OPS were significant, *F*(1, 233)=12.131, *p*<.01.

Table 2

MANOVA – Differences in OPS Performance by Free Agency

Source	*df*	*F*	*p*
Wilks' Lambda	2	6.089	.003
Pillai's Trace	2	6.089	.003
Hotelling's Trace	2	6.089	.003

Table 3

ANOVA – Differences in OPS Performance Between Free Agency Time Periods

Time	*df*	*F*	*p*
Pre-option vs. Option	1	3.287	.071
Option vs. Post-option	1	12.131	.001

Multiple analysis of covariance (MANCOVA) was conducted to determine the effect of free agency on player performance as measured by OPS while controlling for age and team winning percentage. The covariates adjusting for winning percentage were analyzed at three levels: pre-option year team winning percentage, option year team winning percentage, and post-option year team winning percentage. Table 4 presents the results of the MANCOVA with respect to OPS.

The covariate age did not significantly influence the impact of free agency on OPS, Wilks' *F*(2, 228)=2.424, *p* =.091. Likewise, none of the winning percentage covariates (pre-option year team winning percentage: Wilks' *F*(2, 228)=.253, *p*=.776, option year team winning percentage: Wilks' *F*(2, 228)=.371, *p*=.69, post-option year team winning percentage: Wilks' F(2, 228)=2.349, *p*=.098) had a significant affect on the relationship between free agency and OPS production.

Table 4

MANCOVA – Differences in OPS Performance by Free Agency When Controlling for Age and Team Winning Percentage

Covariate	Source	*df*	*F*	*p*
Age	Wilks' Lambda	2	2.424	.091
	Pillai's Trace	2	2.424	.091
	Hotelling's Trace	2	2.424	.091
Pre-Wins	Wilks' Lambda	2	.253	.776
	Pillai's Trace	2	.253	.776
	Hotelling's Trace	2	.253	.776
Option Wins	Wilks' Lambda	2	.371	.690
	Pillai's Trace	2	.371	.690
	Hotelling's Trace	2	.371	.690
Post-Wins	Wilks' Lambda	2	2.349	.098
	Pillai's Trace	2	2.349	.098
	Hotelling's Trace	2	2.349	.098

Runs Created

The second component of sabermetric analysis used to assess the effect of free agency on player performance was Runs Created. Runs Created values were normalized for subjects by dividing each player's value by his number of at-bats each season. The mean number of Runs Created/AB for players in their pre-option year was 0.15779. The last year of a player's contract, the option year, players increased their number of Runs Crated/AB to an average of 0.16587. That number dropped dramatically the following year to 0.15247. The mean number of Runs Created/AB in each option year can be seen in Table 5.

Table 5

Mean Runs Created Values for Players Before and After Free Agency

	Mean	Std. Deviation	N
Pre-RC	.15779	.046783	234
Option RC	.16587	.070198	234
Post-RC	.15247	.048354	234

As with OPS, multivariate analysis of variance (MANOVA) with repeated measures was conducted to determine if there were Runs Created performance differences across the three free agency time periods: the pre-free agency year, the actual free agency year, and the post-free agency year. The results indicated that there were significant differences (Wilks' $F(2,232)=5.571$, $p<.01$) in the Runs Created performance means across the three free agency time periods. Table 6 presents the results of the multivariate tests.

The multivariate tests were again followed up by univariate tests (ANOVA) in order to determine significant performance contrasts within-subjects among the free agency years. Analysis of variance revealed that performance disparities, as determined by measuring the number of runs a player created, between pre-option and options years were not significant, $F(1, 233)=3.472$, $p=.064$. The Runs Created performance differences between option and post-option years, however, were significant, $F(1, 233)=10.478$, $p<.01$. Table 7 demonstrates the within-subjects contrasts.

Table 6

MANOVA – Differences in Runs Created Performance by Free Agency

Source	*df*	*F*	*p*
Wilks' Lambda	2	5.571	.004
Pillai's Trace	2	5.571	.004
Hotelling's Trace	2	5.571	.004

Table 7

ANOVA – Differences in Runs Created Performance Between Free Agency Time Periods

Time	*df*	*F*	*p*
Pre-option vs. Option	1	3.472	.064
Option vs. Post-option	1	10.478	.001

Multiple analysis of covariance (MANCOVA) was conducted to determine the effect of free agency on player performance as measured by Runs Created while controlling for age and team winning percentage. Table 8 presents the results of the MANCOVA with respect to Runs Created. The findings indicated that age did not significantly influence the impact of free agency on the number of runs players created, Wilks' $F(2, 228)=2.147$, $p=.119$.

In addition, the multivariate tests revealed that none of the winning percentage covariates (pre-option year team winning percentage: Wilks' $F(2, 228)=.304$, $p=.738$, option year team winning percentage: Wilks' $F(2, 228)=.791$, $p=.455$, post-option year team winning percentage: Wilks' F(2, 228)=1.863, $p=.158$) had a significant affect on the relationship between free agency and Runs Created.

Table 8

MANCOVA – Differences in Runs Created Performance by Free Agency When Controlling for Age and Team Winning Percentage

Covariate	Source	*df*	*F*	*p*
Age	Wilks' Lambda	2	2.147	.119
	Pillai's Trace	2	2.147	.119
	Hotelling's Trace	2	2.147	.119
Pre-Wins	Wilks' Lambda	2	.304	.738
	Pillai's Trace	2	.304	.738
	Hotelling's Trace	2	.304	.738
Option Wins	Wilks' Lambda	2	.791	.455
	Pillai's Trace	2	.791	.455

Table 8 Continued

	Hotelling's Trace	*2*	*.791*	*.455*
Post-Wins	Wilks' Lambda	2	2.349	.158
	Pillai's Trace	2	2.349	.158
	Hotelling's Trace	2	2.349	.158

Win Shares

The third component of sabermetric analysis used to assess the effect of free agency on player performance was Win Shares. Win Shares values were normalized for subjects by dividing each player's value by his number of games each season. The mean number of Win Shares/G for players in their pre-option year was 0.12296, followed by 0.12870 in their option year and 0.11133 in their post-option year. Each of the mean values, along with their standard deviations can be seen in Table 9.

Table 9

Mean Win Share Values for Players Before and After Free Agency

	Mean	Std. Deviation	N
Pre-WS	.12296	.044386	234
Option WS	.12870	.051726	234
Post-WS	.11133	.049516	234

Consistent with OPS and Runs Created, multivariate analysis of variance (MANOVA) with repeated measures was conducted to determine Win Shares performance differences across the three free agency time periods: the pre-free agency year, the actual free agency year, and the post-free agency year. MANOVA results indicated significant differences (Wilks' $F(2,232)=16.717$, $p<.001$) in the Win Shares performance means across the three free agency time periods. Table 10 presents the results of the multivariate tests.

The multivariate tests were again followed up by univariate tests (ANOVA), as shown in Table 11, in order to determine significant performance contrasts within-subjects among the free agency years. Analysis of variance found that performance disparities, as determined by measuring the number of wins a player was responsible for, between pre-option and options years were not significant, $F(1, 233)=3.374$, $p=.068$. The Win Shares performance differences between option and post-option years, however, were significant, $F(1, 233)=31.365$, $p<.001$.

Table 10

MANOVA – Differences in Win Share Performance by Free Agency

Source	*df*	*F*	*p*
Wilks' Lambda	2	16.717	.000
Pillai's Trace	2	16.717	.000
Hotelling's Trace	2	16.717	.000

Table 11

ANOVA – Differences in Win Share Performance Between Free Agency Time Periods

Time	*df*	*F*	*p*
Pre-option vs. Option	1	3.374	.068
Option vs. Post-option	1	31.365	.000

Multiple analysis of covariance (MANCOVA) was conducted to determine the effect of free agency on player performance as measured by Win Shares while controlling for age and team winning percentage. Table 12 presents the findings of the MANCOVA with respect to Win Shares. The results indicated that age did not significantly influence the impact of free agency on the number of Win Shares a player produce, Wilks' $F(2, 228)=2.193$, $p=.114$.

The results of the MANCOVA indicated that two of the winning percentage covariates, pre-option year team winning percentage, Wilks' $F(2, 228)=2.14$, $p=.12$, and option year team winning percentage, Wilks' $F(2, 228)=2.112$, $p=.123$, had no significant affect on the relationship between free agency and Win Shares. Post-option year team winning percentage did significantly influence the relationship between free agency and the number of Win Shares a player accounted for, Wilks' $F(2, 228)=4.477$, $p<.05$.

Analysis of covariance (ANCOVA) was conducted on the dependent variable as a follow-up test to the MANCOVA. When controlling for pre-option year team winning percentage, within-subjects differences between pre-option year/option year Win Shares, $F(1, 229)=4.292$, $p<.05$, were significant. Differences between option year/post-option year Win Shares, $F(1, 229)=1.449$, $p=.230$, were not significant. Similarly, when controlling for option year team winning percentage, within-subjects differences between pre-option year/option year Win Shares, $F(1, 229)=4.037$, $p<.05$, were significant. Differences between option year/post-option year Win Shares, $F(1, 229)=.2.187$, $p=.141$, were not significant. When controlling for post-option year team winning percentage, within-subjects differences between pre-option year/option year Win shares, $F(1, 229)=1.101$, $p=.295$, were not significant. However, Win Share differences between players' option year and post-option year, $F(1, 229)=8.562$, $p<.01$, were significant. Table 13 presents the results for the ANCOVA analyses.

Table 12

MANCOVA – Differences in Win Share Performance by Free Agency When Controlling for Age and Team Winning Percentage

Covariate	Source	*df*	*F*	*p*
Age	Wilks' Lambda	2	2.193	.114
	Pillai's Trace	2	2.193	.114
	Hotelling's Trace	2	2.193	.114
Pre-Wins	Wilks' Lambda	2	2.140	.120
	Pillai's Trace	2	2.140	.120
	Hotelling's Trace	2	2.140	.120
Option Wins	Wilks' Lambda	2	2.112	.123
	Pillai's Trace	2	2.112	.123
	Hotelling's Trace	2	2.112	.123
Post-Wins	Wilks' Lambda	2	4.477	.012
	Pillai's Trace	2	4.477	.012
	Hotelling's Trace	2	4.477	.012

Table 13

ANCOVA – Differences in Win Share Performance Between Free Agency Time Periods When Controlling for Team Winning Percentage

Covariate	Time	*df*	*F*	*p*
Pre-Wins	Pre-option vs. Option	1	4.292	.039
	Option vs. Post-option	1	1.449	.230
Option Wins	Pre-option vs. Option	1	4.037	.046
	Option vs. Post-option	1	2.187	.141
Post-Wins	Pre-option vs. Option	1	1.101	.295
	Option vs. Post-option	1	8.562	.004

Evaluation

The following section contains an evaluation of the results pertaining to the research questions and hypotheses specific to this study. Based on this evaluation and analysis, a decision was made whether to accept or reject the various hypotheses.

General Research Questions

The first General Research Question asked simply whether or not free agency affected the offensive performance of Major League Baseball players. According to each of the of the MANOVA analyses for the three dependent variables, the answer is yes. OPS, Runs Created, and Win Shares each had significant ($p<.01$) mean differences in terms of performance between pre and post-free agency. The second General Research Question asked “If free agency does impact offensive production, then how?” By examining the means alone, one can see a consistent pattern for each of the performance measures from one year to the next. According to the means for each dependent variable, offensive performance as measured by OPS, Runs Created, and Win Shares is higher in the last year of a player’s contract than the year before (pre-free agency) and the year after (post-free agency). If statistically significant, the findings would support expectancy theory predictions. The following sub-sections answer the specific research questions and discuss the significance of the mean differences across the three free agency time periods.

Research Question One

Research Question One asked if there were significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year. ANOVA analyses revealed no significant differences in OPS (p=.071), Runs Created (p=.064), or Win Shares (p=.068) in the last year of a player's contract when compared to the previous year at the .05 significance level. Therefore, the statistical null hypothesis of no difference in offensive productivity between pre-option year and option year is accepted. As a result, neither equity theory nor expectancy theory predictions are conclusive. It should be noted, however, that given the consistent improvement in mean values for each of the performance measures between the pre-option and option year and the relatively high *F*-values for each dependent variable, it is possible (p<.10) that the mean differences in performance are not due to random error. Results not due to error would be consistent with expectancy theory predictions: offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Research Question Two

Research Question Two asked whether there were significant mean performance differences, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year. Univariate tests of within-subjects contrasts uncovered significant declines in productivity for each performance measure, OPS (p<.01), Runs Created (p<.01), and Win Shares (p<.001), between the last year of a player's old contract (option year) and the first year of a player's new multi-year agreement (post-option year). Based on the results, the null hypothesis of no difference between option year and post-option year offensive production is rejected. These findings are consistent with expectancy theory predictions: offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

Research Question Three

The next four research questions attempted to determine whether external factors, such as age and team winning percentage, influenced the affect of free agency on performance. Research Question Three asked if there were significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of age. Univariate analyses showed no significant differences in OPS (p=.631), Runs Created (p=.798), or Win Shares (p=.681) in the last year of a player's contract when compared to the previous year. Therefore, the statistical null hypothesis of no difference in offensive productivity between pre-option year and option year, when controlling for age, is accepted. According to these findings, neither equity theory predictions nor expectancy theory predictions could be validated.

Research Question Four

Research Question Four sought to answer whether there were significant mean performance differences, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, when controlling for age. Univariate analyses revealed no significant differences in OPS (p=.088), Runs Created (p=.243), or Win Shares (p=.135) in the last year of a player's contract when compared to the previous year, when removing the effects of age. As such, the statistical null hypothesis of no difference in offensive performance from one year to the next is accepted. Again, the results could not substantiate either equity theory predictions or expectancy theory predictions.

Research Question Five

Research Question Five attempted to determine if there were significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' pre-option year to option year, after removing the effects of team winning percentage. When controlling pre-option year team winning percentage, univariate analyses of within-subjects contrasts uncovered no significant differences in performance from the last year of a player's contract to the previous year for OPS (p=.478) or Runs Created (p=.443). The analysis did reveal, however, significant improvement in the number of Win Shares (p<.05) a player produced from his pre-option year to option year. When controlling for option year team winning percentage, univariate analysis indicated no significant change in performance for OPS (*p*=.392) and Runs Created (*p*=.45), but did reveal a significant change in performance from the pre-option year to the option year for Win Shares ($p<.05$). Controlling for post-option year team winning percentage revealed no significant mean differences in productivity for any of the performance measures, OPS (*p*=.735), Runs Created (*p*=.161), or Win Shares (*p*=.295), from the pre-option year to the option year. Based on these findings, the statistical null hypothesis of no difference in offensive productivity from one year to the next is rejected. In both cases, the significant findings for Win Shares are indicative of expectancy theory predictions: offensive productivity will improve in the option year when compared to the previous (pre-option) year.

Research Question Six

The last research question asked if there were significant mean differences in productivity, as measured by OPS, Runs Created, and Win Shares, from players' option year to post-option year, after removing the effects of team winning percentage. When controlling pre-option year team winning percentage, univariate analysis revealed no significance differences in offensive performance from option year to post-option year for any of the dependent variables, OPS (*p*=.796), Runs Created (*p*=.501), or Win Shares (*p*=.23). Likewise, when controlling for option year team winning percentage, univariate tests of within-subjects contrasts showed no significant changes in player productivity for OPS (*p*=.637), Runs Created (*p*=.921), or Win Shares (*p*=.141). Controlling for post-option year team winning percentage, on the other hand, uncovered significant declines in offensive performance from the last year of a player's old contract to the first year of a player's new multi-year agreement for OPS ($p<.05$) and Win Shares ($p<.01$). In addition, the p-value for Runs Created, while not less than .05, actually equaled .05 (*p*=.05), thus making it worthy of mention. According to these findings, the statistical null hypothesis of no difference in offensive productivity from one year to the next is rejected. The significant findings for each performance measure are, again, consistent with expectancy theory predictions: offensive productivity will decline in the first year of a new contract when compared to the previous (option) year.

Summary

This chapter presented the descriptive, statistical, and analytical findings of an examination of the impact of free agency on Major League Baseball player performance. Six research questions were answered in order to determine productivity improvements or declines before and after players became free agents. In addition, specific hypotheses, developed to either support or contradict competing predictions of worker behavior in organizations, were addressed in order to establish a clear theoretical framework for future research.

The initial and most fundamental question to be answered by this study was whether or not there were, in fact, significant changes in player performance between pre- and post-free agency. The results, as determined by sabermetric analysis, indicated significant mean differences in productivity for each of the three offensive performance measures sometime between the year prior to players' free agent year and the first year following the signing of a new multi-year contract. Having established significant disparities in offensive performance among major league players in light of free agency, the next step was to examine how free agency impacted performance. To accomplish this, year-to-year offensive production comparisons were analyzed for each performance measure. Findings would support either J. S. Adam's Equity Theory or Victor Vroom's Expectancy Theory.

To evaluate the impact of free agency on performance, the researcher examined disparities in offensive performance between the last year of a player's existing contract (the option year) and the first year of the player's new multi-year contract (the post-option year). The results revealed significant (p<.01) declines in offensive productivity for each of the three performance measures, OPS (p=.001), Runs Created (p=.001), and Win Shares (p=.000), after players signed their new multi-year agreements. These findings are consistent with expectancy theory predictions which postulate that once monetary rewards have been attained, players are less motivated to perform at their best and, as a result, on-the-field performance suffers.

With respect to performance comparisons between players' pre-option year and option year, results at the .10 significance level indicated that player performance improved from the pre-option year to the last year of a player's contract for each of the performance measurements, OPS (*p*=.071), Runs Created (*p*=.064), and Win Shares (*p*=.068). These findings, while not significant at the .05 level are worth discussing because they are also indicative of expectancy theory predictions and support its utility as the central theoretical framework for this line of future research. In this case, expectancy theory proposes that players perceive monetary rewards and job security to be desirable outcomes worth exerting additional effort for. It is reasonable to expect that players are motivated to improve offensive productivity in anticipation of more lucrative, long-term financial contracts.

In order to control for specific factors thought to influence the impact of free agency on performance, covariates age and team winning percentage were included in the statistical analysis. The results showed that the age of players was not a contributing factor to the performance disparities associated with year-to-year comparisons. With regards to team winning percentage, findings showed that when controlling for post-option year team winning percentage, offensive performance comparisons between option year and post-option year were significant ($p<.05$) for two of the performance measures, OPS (*p*=.039) and Win Shares (*p*=.004), and worth mentioning for the third, Runs Created (*p*=.054). Analysis of the results indicates that players signed their new multi-year contracts with weaker teams, perhaps choosing the lure of money over the prospect of winning. Controlling for pre-option year and option year team winning percentage revealed no significant findings for OPS and Runs Created. However, for Win Shares, both pre-option year and option year team winning percentages covariates accounted for significant ($p<.05$) improvement in player productivity for the pre-option/option year performance comparison. Again, these outcomes are consistent with expectancy theory predictions and tend to support the idea that the team dynamic does, in some way, influence the impact of free agency on player performance.

Ultimately, every significant finding for this research substantiated Vroom's theory of worker behavior in organizations. Thus, this study accepts the expectancy theory hypotheses stated in Chapter One: (H1) Player performance will improve in the option year when compared to the previous year and (H2) A player's performance will decline in his first year of a new contract when compared to his option year. Furthermore, validation of this theory indicates that free agency negatively impacts players' future performance, the implications of which will be discussed in the next chapter.

CHAPTER V

SUMMARY

The current study was conducted in order to address specific worker performance issues in the context of sport, particularly, Major League Baseball. For decades, researchers have been trying to determine what impact, if any, free agency has on player performance. This particular subject matter is often a “hot topic” issue in many circles. Everyone from the casual fantasy baseball enthusiast to the millionaire team owners and general managers, in every place from the office water cooler to the inner-most bowels of Yankee Stadium, has analyzed the evidence, examined the statistics, studied the data, charted the trends, and concluded, well, nothing. Sure, some have their own personal opinion regarding the issue, but few have presented conclusive evidence as to determining the effect that free agency has on Major League Baseball player performance. The valid findings that do exist, mainly from academic research, are contradictory. One reason for the inconsistent results could be because the aforementioned “evidence” is derived from humans, and human behavior is often difficult to even understand, much less predict. Or, perhaps the reason could be attributed to the fact that past research has not effectively qualified “performance” or accurately assessed “productivity.” This study agrees with the later idea.

Deviating from prior free agency/performance research (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991; Lord & Hohenfeld, 1979; Sturman & Thibodeau, 2001; Werner & Mero, 1999), this study assessed player productivity using sabermetrics. Past research has relied on one-dimensional measures of performance, many of which were situation and team dependent (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991; Lord & Hohenfeld, 1979; Sturman & Thibodeau, 2001). By using a more multi-dimensional approach to measure offensive production, this research was able to establish a more definitive and reliable evaluation of player performance across time. Traditional statistics have their place in baseball and in academic research, but solely relying on them to make an accurate determination of the effect of free agency on overall offensive productivity is similar to a physician determining the effectiveness of radiation therapy on cancer patients based on the individuals' vital signs. While important, measurements such as body temperature and blood pressure are not comprehensive enough to determine if the treatment has improved the overall health of the patients. OPS, Runs Created and Win Shares were chosen for their individual and collective abilities to measure and quantify offensive productivity as it relates to individual player performance.

In addition to determining the effects of free agency on performance, this research also attempted to establish a clear theoretical framework for which future organizational behavior studies could expound on. Focusing on two fundamental social behavior theories commonly used to predict worker performance, J. S. Adams' Equity Theory and Victor Vroom's Expectancy Theory, the current study presented competing hypotheses consistent with each theory's predictions. Equity theory suggests that workers are motivated to "perform" based on inequity. Adams (1963) believed that how an individual perceives the balance of effort and reward in comparison to referent others determines how that individual performs at his/her work. Workers who perceive themselves as being over-rewarded or under-rewarded would be likely to increase or decrease their contributions respectively, in order to restore an equitable balance. In the context of Major League Baseball, equity theory proposes that players who perceive inequity as a result of under-reward will decrease their production in order to re-establish an equitable relationship between their inputs and outcomes. On the other hand, those players that receive guaranteed multi-year contracts who perceive they are over-rewarded in relation to teammates or other players will be motivated to increase their productivity in order to create a more fair and balanced perception of equity.

Expectancy theory maintains that individuals are motivated to perform based on the value of available rewards and the perception of whether those rewards are attainable. Vroom (1964) suggested that individuals' perceptions create a motivational force which influences behavior, and when deciding among behavioral options, individuals select the option with the greatest motivational force. Specific to baseball, expectancy theory hypothesizes that players will improve their production in the wake of long-term contracts and substantial pay raises often associated with free agency, only to decrease productivity after rewards have been attained.

Consistent findings for this study, in line with either theory's predictions, would indicate valid support for a definitive theoretical framework. In order to obtain those findings, this dissertation relied on multivariate analysis of variance (MANOVA) and covariance (MANCOVA) statistics with repeated measures to test for significant mean differences in offensive productivity, as measured by OPS, Runs Created, and Win Shares, across time. Follow-up univariate analysis of variance (ANOVA) was conducted for each dependent variable to determine when significant improvements/declines in performance occurred.

Results

The actual results for this study were consistent with expectancy theory predictions. All significant findings supported expectancy hypotheses. In addition to affirming a clear theoretical framework, the current research demonstrated that offensive productivity declines following free agency and the signing of guaranteed multi-year contracts. Offensive productivity, in this study, refers to metrics: OPS, Runs Created, and Win Shares. Both individually and collectively, these comprehensive performance statistics measure the most fundamental offensive aspects of the game: hitting, getting on base, scoring, and winning. According to the statistical analysis conducted in this study, players experienced significant declines in each of the three sabermetric performance categories after signing new multi-year contracts. The significant results associated with declines in performance for all three of the measurements, OPS, Runs Created, and Win Shares, can be interpreted as substantial evidence that free agency affects a player's overall level of productivity, not just certain aspects, as past studies (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991; Lord & Hohenfeld, 1979; Sturman & Thibodeau, 2001; Werner & Mero, 1999) have claimed. For example, multivariate analysis of OPS in conjunction with free agency revealed significant mean differences in player performance between pre- and post-free agency. Like wise, MANOVA tests for both Runs Created and Win Shares showed that player productivity was significantly affected between the examined period of time: before and after free agency. Follow-up univariate analyses confirmed that, for each sabermetric measurement, performance means declined between the last year of players' contracts (option year) and the first year after players signed guaranteed multi-year deals (post-option year).

When controlling for the covariate age, MANCOVA tests revealed no significant mean differences in performance for any of the three performance measures, indicating that players' age did not influence free agency's impact on offensive productivity as determined by OPS, Runs Created, and Win Shares. The lack of significant effects for age could be attributed to the brief individual time periods that players were examined. While this longitudinal study looked at thirty years of data, performance statistics only measured player productivity for a three year interval: players' (1) pre-option year, (2) option year, and (3) post-option year. Based on the limited time parameters, it is reasonable to assume that player performance would not decline significantly, due to age, over such a short duration. In order to accurately assess the influence of age, one might compare players' pre- and post-free agent performance data with their past and future statistics. If performance continues to steadily decline, the results may be less indicative of expectancy theory predictions of a lack of motivation and more consistent with a natural digression of skills due to age.

With respect to the covariates for team winning percentage, only post-option year team winning percentage accounted for significant mean performance declines, as measured by Win Shares, among players between their option year and post-option year. This finding suggests that a significant number of players sign their new multi-year contracts with weaker teams and contribute less to winning. Neither OPS nor Runs Created revealed team winning percentage as having an impact on free agency relative to performance. While there is no way to definitively conclude that free agency appears to affect players the same regardless of whether they play for a winning team, the results do indicate that, at least for two of the three performance measurements, there is no correlation between winning and performance in connection with free agency. Furthermore, the correlation between Win Shares and the team winning percentage covariate could be attributed to commonalities between the variables. For example, Win Shares directly measures a player's contribution to winning, and the team winning percentage covariate attempts to control for winning, thus, there may be some overlap in terms of common effects.

So, what do these findings mean for Major League Baseball? What are the implications for team owners and general managers? While this study was designed to assess player performance within an organizational behavior framework, in order to effectively address these and other questions, it is relevant to discuss the findings from an economic perspective as well. The following sections will address the aforementioned questions, provide an in-depth analysis of the results, offer practical suggestions for implementation of the findings, discuss the limitations of the study, and offer suggestions for future research.

Conclusions

The current research provides insight into a topic that many researchers, baseball writers, and industry leaders have discussed, analyzed, and speculated about for years: performance disparities in connection with free agency. This study examined comprehensive performance data for over two hundred subjects spanning thirty seasons of play and found that, in the wake of free agency, offensive productivity for Major League Baseball players significantly declines immediately following the signing of new multi-year contracts. The present study supports past research (Ahlstrom, Si, & Kennelly, 1999; Duchon & Jago, 1981; Harder, 1991) in that expectancy theory predictions are confirmed with respect to offensive player performance. While this study measured offensive productivity using sabermetrics and past research relied on traditional measures, the end results were the same: players experience performance decrements in connection with long-term contracts.

The practical and theoretical implications associated with the findings of this study are numerous. Utility of the results and their implications from an industry perspective could extend far beyond baseball. This study's validation of expectancy theory predictions with respect to worker motivation and performance could support arguments against long-term job security, advocating for one year contracts and annual salary negotiations between organizations and employees. It is not known exactly what impact, if any, these findings could have on professional baseball as a business. However, the machine that is Major League Baseball, a multi-billion dollar sports entertainment commodity, probably dislikes any notion that suggests its handsomely compensated world-class athletes are underperforming due to a lack of motivation. It is unlikely that the average ticket buyer/products consumer would be very sympathetic toward millionaires who appear to perform less than their best. Aside from potentially sustaining another public relations “black eye” for a sport already marred by steroid allegations and labor strikes, significant evidence that players under-perform amid financial and job security assurances also stands to affect the bottom line, team revenues.

The academic implications for this study could prove useful to sport management researchers as well as research scholars in other areas of academia. The findings of this research create a framework which could serve as a foundation for future studies. For example, organizational behaviorists may be interested in this study’s findings regarding performance outcomes in relation to perceived reward; Motivation researchers could potentially utilize the findings of this study as a means to assess the “how” and “why” aspects of motivation in connection with worker performance; Economic theorists may be able to apply the results of this study toward a more definitive quantification of monetary rewards and their impact on perceptions and, subsequently, productivity. Each of these research areas is incorporated in the sport management literature as well. Thus, sport management researchers are able to utilize the results of this study in the context of several different academic areas.

The current research contributes to the sport management literature, specifically, by formally introducing a more comprehensive measurement of baseball player performance, sabermetrics. The present study serves as one of the first scholarly empirical research studies to solely utilize sabermetrics as a measure of player performance. Time will tell if this study was a pioneer in terms of its reliance on sabermetrics to assess productivity, or if it was another overstatement of the usefulness and validity of an alternative measurement. If sabermetrics are embraced in the world of academia as they have been by the mainstream industry and media, then, perhaps, more research studies incorporating sabermetrics will follow.

From a practical perspective, one of the best justifications for conducting this line of research originates from a general misunderstanding of how free agency affects an organization. On paper, the economic impact of free agency appears relatively straightforward. Unfortunately for team owners, the dynamics of free agency are more complicated than merely determining the dollars and cents owed to a player. The challenge lies in assessing how those dollars and cents translate into value for the organization. Value in this context refers to productivity and winning.

For team owners and general managers, the results of this study are potentially disheartening. Statistical evidence shows that player performance significantly declines following free agency. These findings indicate that organizations do not get a fair return on their money. Analyzing the results of free agent signings is similar to analyzing stocks on the market. Players, like stocks, are, essentially, investments. Teams choose and purchase their investments much in the same way that investors choose and purchase stocks. The criterion for investing in both is based on past performance and future potential. Oftentimes, the prices of the investments are determined by their performance history. As a result, when the investments do not perform in accordance with their historical averages, both teams and investors are left with unfair returns.

The findings from this study show that, in the case of Major League Baseball free agents as a whole, past performance is not indicative of future productivity. Thus, more often than not, teams are actually paying free agents for a higher level of performance than they are receiving. In the financial world, such repeated poor returns would necessitate the investors to cut their losses and sell their underperforming investments. In Major League Baseball, however, organizations are obligated to keep their underperforming investments through guaranteed multi-year contracts. Maybe it is time for Major League Baseball to reevaluate its current labor system. Maybe changes to free agency are warranted. Perhaps the business of baseball should be conducted more like the business on Wall Street. Imagine if investors speculated that the majority of all stocks actually underperformed and lost money after they were purchased. Obviously, stock prices would go down and investors would be much more cautious investing in the stocks they did purchase. This is where the parallel between professional baseball and the stock market ends. Baseball insiders have long suspected performance decrements in association with post-free agency contracts (T. Purpura, personal communication, August 23, 2005; S. Alderson, personal communication, September 1, 2005). Yet, during the last twenty five years, Major League Baseball salaries have increased dramatically, from

Nolan Ryan's one million dollar a year salary in 1980 to Alex Rodriguez's unprecedented 25 million dollar a year salary in 2001 (Conn, 2004).

The average professional baseball player earned $2,376,577 in 2003, compared to $119,113 in 1976, $73,635 in 1950, and $34,672 in 1898. Between 1898 and 1950, average player salaries grew at a rate of 1.46 percent annually. From 1950 to 1976, average salaries grew at a rate of 1.87 percent annually. Between 1976 and 1991, the first fifteen years of free agency, average salaries grew at an annual rate of 13.8 percent, or over seven times the rate of growth of the previous twenty-six years. Since 1998, salaries have continued to escalate at an average annual increase rate of 11.6 percent (Zimbalist, 1992b; Conn, 2004).

Somewhere amongst the anti-trust lawsuits and the player bidding wars, amid the emergence of "super agents" like Scott Boras, and sometime between the unveiling of expansion teams and proposals for contraction, the business of baseball changed. The catalyst for such change was free agency. The results of the change, according to this study, seem to create an imbalance between motivation and performance, the impact of which can be seen as significant decline in offensive player productivity. In keeping with expectancy theory, the results could indicate that players are less motivated to be productive after signing multi-year contracts because there are no incentives in the form of financial rewards or job security. Without measuring player motivation directly, the theoretical implications are merely inferential assessments based on the outcomes of statistical analysis. However, these assessments are valuable in determining the possible impediments associated with free agency and performance. The following section offers the researcher's practical recommendations for helping to prevent premature declines in performance due to insufficiencies of motivation.

Practical Recommendations

Based on the findings of this study and a thorough review of literature relating to the research, several practical recommendations for organizations and team owners can be presented.

1. **Teams should sign all free agents to shorter-term contracts.**

Perhaps it is worth revisiting Charles O. Finley's proposal, at least in principle, regarding free agency. As discussed in Chapter One, Finley suggested that organizations sign all players to renewable one year contracts. According to Mr. Finley, this action would reduce the liability and risk associated with multi-year contracts and create more competitive league. Unfortunately, proceeding with Mr. Finley's idea in this day and age would be an obvious violation of labor law. However, there are ways for ownership to minimize the length of free agent contracts without reverting to single year deals. Doing so would help ensure better control of the market demand for free agents and reduce the liability concerns associated with injury and performance.

2. Major League Baseball should follow the example of the National Football League and discontinue guaranteed contracts.

Essentially, this would create a situation where players would be competing for their jobs from year to year and even from game to game. In would certainly eliminate most problems of under-motivation while helping to restore competitive balance within the league. When asked about the NFL's stance on guaranteed contracts, long time and current Philadelphia Eagles President, Joe Banner said, "I don't believe guaranteed contracts are in the best interests of players, teams or fans. Right now, the system is set up so everyone works hard and is motivated to perform. If money went to players who were not playing or injured, that means much less money for the other players who are making a difference" (Jensen, 2005). In order for teams to attract players to sign with their organization, guaranteed money could be offered through signing bonuses or performance incentives.

3. Organizations should incorporate a "pay for play" compensation system.

In other words, players should be rewarded based on their past performance, not on their future potential. Under this system, players could be paid a universal minimum salary based on years of service. Naturally, the ten year veteran would have a higher base pay that the first year rookie. Performance incentives in the form of increased pay could then be offered to each player in accordance with pre-determined goals set forth by each team. Under this merit pay system, players who performed the best would make the most money. As in arbitration, an impartial mediator could be used to define the subtle nuances for specific situations where problems might arise. Again, this would help prevent motivational performance decrements associated with free agency and guaranteed multi-year contracts, while minimizing the risk for teams.

Limitations

As in all research, this study is subject to certain limitations, some of which can possibly be addressed in future research. This research study found that offensive performance significantly declined the year following free agency. What it does not explain, however, is why. Expectancy theory suggests that the decline is directly correlated to a lack of motivation on the part of the players. This notion, deeply rooted in theory and supported by past research, offers a reasonable explanation as to why productivity suffers. Yet, unless player motivation is actually measured, neither this research nor any other can confirm this theoretical prediction. The problem with directly measuring player motivation is two-fold. First, the logistics of conducting such a study would not be conducive for the average researcher. During the season, there are over 800 major league players on thirty two teams scattered throughout two countries. The possibility of even being allowed access to these players is not favorable, not to mention the fact that one would literally have to travel from city to city to gather the data. This task would be both time consuming and considerably expensive. Second, there is a strong possibility that players would not be honest about their motivations, thus, jeopardizing the study's validity.

The current study presents certain assumptions that may potentially limit the interpretive value of the findings. For example, this study assumes that players perceive inequitable conditions of under-reward and over-reward preceding and following free agency, respectively. These assumptions are based on J. S. Adams' theory of worker motivation, but the researcher concedes that they are generalizations that may not apply to all or most Major League Baseball players. Without actually measuring individual player perceptions of equity regarding rewards and motivation, the assumptions remain subject to scrutiny.

Assuming that the performance declines resulted from a lack of motivation does not insinuate that players intentionally stop trying to succeed once they sign their free agent contracts. It is doubtful that the newly financially satisfied, employment secured player conceives of undermining his God-given talents to purposely under-perform. Rather, it is more likely that the lack of motivation takes a more subtle toll on player productivity. For example, if a player is guaranteed the same amount of money over the next five years regardless if he hits .150 or .350, a poorly motivated player is unlikely to do the necessary preparations that will maximize his potential. That player may not feel the need to take extra swings in the cages or watch film of opposing pitchers. He may not be motivated to conduct his off-season workout regimen or to do a number of things that can have an impact on performance over the course of a 162 game season.

It is often a challenge to determine the cause of any behavior, mostly because there are so many factors that can influence it. In this study, age and team winning percentage were used as covariates in order to attempt to control for such factors. Age had no significant effect on free agency and its impact on performance. One reason for this could be that the study only measured performance over a three year period. It is unlikely that player productivity would change enough over such a short time to make a dramatic difference. As for team winning percentage, the findings indicated that post-option year winning percentage significantly influenced the impact of free agency on performance. This could be explained by the fact that the majority of players changed teams after their free agent year. Playing on a different team could certainly affect motivation and performance for a variety of reasons.

Along with the covariates used in this study, there are countless other factors as well as intangible characteristics that could affect player performance. While it would be impossible to measure and control for all of them, some are worthy of further investigation. For example, it may be useful to investigate how injuries affect performance in light of free agency. According to Bill James, Senior Baseball Operations Advisor for the Boston Red Sox, injuries are a major concern for players and organizations alike in connection with looming free agency. Mr. James stated, “There are free agents who are under a lot of pressure to perform in their walk year, who perhaps try to play through injuries when they shouldn’t, and the season just collapses on them” (B.

James, personal communication, September 15, 2005). Many players did not qualify for this study because they did not meet the minimum number of at-bat requirements in one or more of the three years being examined. It is reasonable to assume that, unless the player was a part-time utility player, injury played some role in the limited number of at-bats for the free agents. Are, as Mr. James contends, free agents more likely to play through injuries in order to “cash in” on a new contract? Are players more willing to go on the disabled list after they sign their guaranteed contracts, or does their competitive spirit still make them hesitant? Studies conducted by Helyar (1991) and Lehn (1982) found that players with guaranteed multi-year contracts spend 50% more time on the disabled list than players with one-year contracts. This research suggests that injury is a factor in free agent performance and motivation. Perhaps players who play through minor injuries in their walk year actually sustain irreparable damage to their bodies, thus affecting their performance level in the future. By controlling for injury, one may be able to better assess how and why players experience performance declines following free agency. There are, in fact, limitations to using injury covariates, as well. Accurate injury information is often difficult to obtain. Also, other than surveying players, there is no way to effectively ascertain whether a player is playing through an injury.

Another potential control variable that could be used in similar studies to analyze free agent performance is the number of times that players file for and receive multi-year free agent contracts. For example, it might be productive to determine if first-time free agents experience the same performance declines that second and third-time free agents do. A simple covariate distinguishing the number of times that a player became a free agent might provide more insight into when players actually experience declines. Taking it a step further, one could determine, through a separate study, whether actual motivation increases or decreases each time a player becomes a free agent. Again, a challenge with this type of study would be that the researcher would actually have to assess various levels of motivation through interviews or survey methods.

Ultimately, much more research is needed in this area in order to better understand why performance declines following free agency. Are performance decrements directly associated with poor motivation due to financial and job security, or are there other reasons to explain the declines in offensive production? Perhaps the greatest limitation to this study is the numbers themselves. Through sabermetrics, one can measure and determine a variety of factors affecting performance: how well a player can hit, his ability to get on base, his ability to create runs, how many wins he is responsible for, etc. Yet, it is what sabermetrics can not reveal about player performance that is, perhaps, most useful. Sabermetrics can not assess what drives a player; it does not reveal player character; it does not measure determination. In baseball, these attributes are referred to as "intangibles", meaning they can not be measured through statistics. Tim Purpura, General Manager for the 2005 National League Champion Houston Astros, explained it this way. Mr. Purpura said:

> "Statistics are a huge part of the game. The game is all about numbers. [Your opinion] about sabermetrics depends on how much stock you put in the numbers. Every decision I make as a general manager is based on the numbers. We have our own metrics we use to evaluate performance. However, numbers won't tell you what's inside a guy……You must also analyze the personal side of players; determine what drives this guy. Is he motivated by winning, money, etc? We use what we call a sixth tool make-up. It's a psychological profile of players and it tells us why they [behave] certain ways (T. Purpura, personal communication, August 23, 2005).

This study relied solely on the "numbers" to determine that player performance declined in the wake of free agency. Future studies should incorporate more assessments of the aforementioned "intangibles" to determine why performance declines. The final section discusses the possible parameters for these types of studies and outlines new directions for future research.

Recommendations for Future Research

This study is meant to serve as a foundation for future research dealing with performance issues relating to free agency. Utilization of the conceptual framework outlined in this study will allow for future research to expound upon the findings. Professional baseball, as a sport industry, offers a vast consortium of resources which researchers can utilize to explore how and why players perform differently under certain conditions. Advancement in this area of research is largely dependent on sound theory and accurate assessments of performance.

Past research exploring the issue of performance in baseball has relied on two theoretical perspectives, organizational behavior theory and economic theory. Both are extremely applicable to the subject and actually overlap in many areas. One can not broach this topic without incorporating principles from each of the academic disciplines. Economic ideologies regarding player value and team revenue are especially relevant subjects given the business nature of this research. By taking this research study one step further, one could potentially determine if the players who experienced declines in productivity were, in fact, over-paid. It would be interesting to determine if player perceptions regarding over-reward and under-reward were consistent with their actual value to their organizations.

According to Scully (1974b), the value of a baseball player is quantified in terms of his marginal revenue product, or the value of his contribution to team revenue. In other words, a player's marginal value is the amount of revenue a team would make with him but not make without him according to his ability and performance. Essentially, a player's marginal revenue product is based on each player's contribution to significant team performance variables, the effect of those performance variables on winning, and, in turn, the effect of winning percentage on team revenue in the form of gate receipts, merchandise sales, and broadcast contracts (MacDonald & Reynolds, 1994). These effects are, for all intents and purposes, just estimates which are not meant to be precise. However, they do give a general sense of the value of a player and his contributions to team success (Zimbalist, 1992a). Based on these estimates of value, a team's success on-the-field in terms of winning games and off-the-field in terms of financial gains is directly linked to player performance and productivity. Accounting for this value in connection with proven performance decrements associated with free agency could prove useful in determining the extent of the problem facing organizations.

This dissertation was one of the first scholarly research studies conducted utilizing sabermetrics, exclusively, as a means for measuring and determining offensive productivity. Since professional baseball, as an industry, is becoming more receptive to and more reliant on sabermetrics as comprehensive assessments of player performance, the academic research should reflect its acceptance and recognize its potential value by utilizing these metrics in conjunction with or in place of traditional statistics. The future for sabermetric research is limitless. Countless websites, message boards, usenet groups, and membership based organizations are conducting sabermetric based research. The mainstream media has now embraced these “alternative” statistics. Numerous books and non-scholarly journals are dedicated to this topic. Institutions of higher education are even offering courses on sabermetrics and sabermetric research. Yet, the academic world, often the catalyst for innovation and new ideas, has been resistant to the seemingly inevitable change that is sabermetrics.

In connection with the current study, sabermetric based research should focus on incorporating other aspects of the game in addition to offensive performance. For example, through sabermetric analysis, researchers could determine whether players’ production declines were limited to offensive performance or if fielding and pitching also suffered as a result of guaranteed long-term contracts associated with free agency. Conclusive evidence that pitching and defensive productivity experience the same decrements as offensive productivity would further validate expectancy theory predictions and support arguments against long-term player contracts. On the other hand, significant findings for either pitching or defensive productivity, or both, indicating that performance does not decline as a result of looming free agency would not only contradict expectancy theory, but it would also suggest that only certain aspects of player performance are subject to decline as a result of motivational loss in connection with increased financial and job security. Perhaps one could develop a sound comprehensive sabermetric measurement assessing both offensive and defensive production combined. Combining both offensive and defensive productivity into a single universally identifiable metric would enable practitioners and researchers alike to examine how certain factors, such as free agency, affects individual player performance both in the batters box and on the field.

APPENDIX A

Pre-Option Year Performance Data Set

Year	Name	Age	Games	AB	Pre-OPS	Pre-RC	Pre-WS	Pre-W%
1976	Bando, Sal	32	160	562	0.693	72	19	HIGH
	Baylor, Don	27	145	524	0.849	90	24	HIGH
	Campaneris, Bert	34	137	509	0.667	60	17	HIGH
	Cash, Dave	28	162	699	0.744	100	24	LOW
	Fuentes, Tito	32	146	565	0.658	58	15	LOW
	Hebner, Richie	28	128	472	0.711	60	12	HIGH
	Jackson, Reggie	30	157	593	0.84	99	27	HIGH
	Matthews, Gary	25	116	425	0.807	70	16	LOW
	Tenace, Gene	29	158	498	0.859	98	32	HIGH
1977	Gamble, Oscar	27	110	340	0.743	47	12	HIGH
	Hisle, Larry	30	155	581	0.73	77	19	LOW
	Zisk, Richie	28	155	581	0.808	88	24	HIGH
1978	Evans, Darrell	31	144	461	0.768	70	13	LOW
	Rose, Pete	37	162	655	0.809	111	23	LOW
	Thomas, Derrel	27	148	506	0.707	62	13	LOW
1979	Morgan, Joe	35	132	441	0.733	67	17	HIGH
	Office, Rowland	26	146	404	0.651	41	8	LOW
	Patek, Freddie	34	138	440	0.63	49	11	HIGH
	Perez, Tony	37	148	544	0.785	80	18	LOW
	Stennett, Rennie	28	106	333	0.584	26	5	LOW
1980	LeFlore, Ron	32	148	600	0.77	95	21	LOW
	Winfield, Dave	28	159	597	0.953	131	33	LOW
1981	Burroughs, Jeff	30	99	278	0.8	44	11	LOW
	Collins, Dave	28	144	551	0.736	86	22	LOW
	Fisk, Carlton	33	131	478	0.819	77	18	LOW
	Jackson, Reggie	35	143	514	0.995	123	31	HIGH
	Speier, Tony	31	128	388	0.681	44	12	HIGH
1982	Almon, Bill	29	103	349	0.717	46	13	LOW
	Ashby, Alan	30	83	255	0.725	33	11	HIGH
	Baylor, Don	33	103	377	0.749	50	9	LOW
	Cowens, Al	30	85	253	0.667	29	7	HIGH
	Garvey, Steve	33	110	431	0.732	54	13	HIGH
	Kemp, Steve	27	105	372	0.809	63	17	HIGH
	McRae, Hal	36	101	389	0.726	49	8	LOW
1983	Cabell, Enos	33	125	464	0.608	41	4	LOW
	Carew, Rod	37	138	523	0.799	83	17	HIGH
	Evans, Darrell	36	141	465	0.779	73	20	LOW
	Simmons, Ted	33	137	539	0.759	69	19	HIGH
1984	Lacy, Lee	36	108	288	0.758	42	9	LOW
	Lynn, Fred	32	117	437	0.835	75	16	LOW
	Thornton, Andre	34	141	508	0.822	89	18	LOW
1985	Beniquez, Juan	35	110	354	0.822	55	13	LOW
	Bernazard, Tony	28	140	439	0.577	37	6	LOW
	Bochte, Bruce	34	148	469	0.678	53	10	LOW
	Fisk, Carlton	37	102	159	0.757	48	10	LOW
	Gibson, Kirk	28	149	531	0.879	105	26	HIGH
	Grich, Bobby	36	116	363	0.809	57	16	LOW

	McRae, Hal	39	106	317	0.76	45	8	LOW
1986	Boone, Bob	38	150	460	0.623	44	12	HIGH
	Concepcion, Dave	38	155	560	0.645	53	12	LOW
	Dawson, Andre	31	139	529	0.739	67	16	LOW
	DeCinces, Doug	35	120	427	0.757	54	12	HIGH
	Downing, Brian	35	150	520	0.798	86	21	HIGH
	Jackson, Reggie	40	143	460	0.847	78	18	HIGH
	Knight, Ray	33	90	271	0.58	18	2	HIGH
	Parrish, Lance	30	140	549	0.802	81	20	LOW
	Raines, Tim	26	150	575	0.88	126	36	LOW
	Randolph, Willie	31	143	497	0.738	69	20	HIGH
	Ward, Gary	32	154	593	0.763	81	12	LOW
	Whitt, Ernie	34	139	412	0.767	57	15	HIGH
1987	Butler, Brett	30	161	587	0.731	83	20	LOW
	Davis, Chili	27	153	526	0.791	82	21	LOW
	Davis, Mike	28	142	489	0.768	72	18	LOW
	Gaetti, Gary	28	157	596	0.865	98	23	LOW
	Hubbard, Glenn	29	143	408	0.644	46	12	LOW
	Law, Vance	30	112	360	0.623	33	8	LOW
	Molitor, Paul	30	105	437	0.765	64	14	LOW
1988	Bush, Randy	29	122	293	0.762	45	9	LOW
	Evans, Darrell	41	150	499	0.88	102	22	HIGH
	Ganter, Jim	35	81	265	0.701	32	7	HIGH
	Marshall, Mike	28	104	402	0.787	54	11	LOW
	Sax, Steve	28	157	610	0.7	76	18	LOW
	Templeton, Gary	32	148	510	0.577	41	6	LOW
1989	Backman, Wally	29	99	294	0.731	42	12	HIGH
	Brooks, Hubie	32	151	588	0.766	77	19	LOW
	Hall, Mel	28	150	515	0.704	62	13	LOW
	Hrbek, Kent	29	143	510	0.907	103	19	HIGH
	Moseby, Lloyd	28	128	472	0.712	66	13	LOW
	O'Brien, Pete	31	156	547	0.76	79	17	LOW
	Parker, Dave	38	101	377	0.72	48	10	HIGH
	Pena, Tony	32	149	505	0.68	56	17	LOW
	Pettis, Gary	31	129	458	0.562	43	12	LOW
	Yount, Robin	33	162	621	0.834	106	31	LOW
1990	Bell, George	30	153	613	0.788	89	22	LOW
	Butler, Brett	33	154	594	0.703	78	27	LOW
	Clark, Jack	34	142	455	0.869	93	31	LOW
	Coleman, Vince	28	145	563	0.65	70	11	LOW
	Daulton, Darren	28	131	368	0.612	36	11	LOW
	Davis, Chili	30	154	560	0.775	79	22	HIGH
	Deer, Rob	29	130	466	0.729	58	12	LOW
	Gaetti, Gary	31	130	498	0.69	55	12	LOW
	Gibson, Kirk	33	71	253	0.679	31	5	LOW
	Pendleton, Terry	29	162	613	0.702	71	18	LOW
	Strawberry, Darryl	28	134	476	0.779	71	18	LOW
	Tettleton, Mickey	29	117	411	0.877	79	20	LOW
	Wilson, Willie	34	112	383	0.657	43	10	HIGH
1991	Bonilla, Bobby	28	160	625	0.841	103	23	HIGH
	Duncan, Mariano	28	125	435	0.821	68	15	HIGH
	Gladden, Dan	33	136	534	0.69	60	11	LOW
	Harper, Brian	31	134	479	0.76	61	14	LOW
	Joyner, Wally	29	83	310	0.744	43	9	LOW
	Lavalliere, Mike	30	96	279	0.706	35	12	HIGH
	Murray, Eddie	35	155	558	0.934	117	31	LOW

	Stillwell, Kurt	26	144	506	0.656	53	12	LOW
	Tartabull, Danny	28	88	313	0.814	49	10	LOW
	Thon, Dickie	33	149	552	0.654	56	10	LOW
1992	Boggs, Wade	34	144	546	0.881	106	25	LOW
	Bonds, Barry	27	153	510	0.924	118	37	HIGH
	Carter, Joe	32	162	638	0.833	107	23	HIGH
	Davis, Chili	32	153	534	0.892	106	22	HIGH
	Dawson, Andre	37	149	563	0.79	79	20	LOW
	Felder, Mike	30	132	348	0.652	41	9	LOW
	Gagne, Greg	30	139	408	0.705	45	12	HIGH
	Molitor, Paul	35	158	665	0.888	131	30	LOW
	Orsulak, Joe	30	143	486	0.679	55	9	LOW
	Owen, Spike	31	139	424	0.686	47	11	LOW
	Puckett, Kirby	31	152	611	0.812	90	21	HIGH
	Santiago, Benito	27	152	580	0.7	60	16	LOW
	Smith, Ozzie	37	150	550	0.747	86	25	LOW
	Steinbach, Terry	30	129	456	0.698	51	13	LOW
	Whitaker, Lou	35	138	470	0.881	98	26	LOW
1993	Clark, Will	29	144	513	0.86	97	28	LOW
	Murray, Eddie	37	156	551	0.759	78	20	LOW
	Nixon, Otis	34	120	456	0.695	59	16	HIGH
	Palmeiro, Rafael	28	159	608	0.786	95	24	LOW
	Polonia, Luis	28	149	577	0.666	64	13	LOW
	Raines, Tim	33	144	551	0.784	99	28	LOW
	Weiss, Walt	29	103	316	0.545	25	5	HIGH
1994	Blauser, Jeff	28	161	597	0.837	110	29	HIGH
	Buhner, Jay	29	158	563	0.855	103	22	LOW
	Jefferies, Gregg	26	142	544	0.894	113	28	LOW
	McLemore, Mark	29	148	581	0.721	72	14	LOW
	Pendleton, Terry	33	161	633	0.718	76	16	HIGH
	Walker, Larry	27	138	490	0.841	91	24	HIGH
1995	Alomar, Roberto	27	107	392	0.838	68	13	LOW
	Biggio, Craig	29	114	437	0.893	99	26	HIGH
	Boggs, Wade	37	97	366	0.922	80	18	HIGH
	Conseco, Jose	30	111	429	0.939	86	16	LOW
	Gagne, Greg	33	107	375	0.706	40	11	HIGH
	Henderson, Rickey	36	87	296	0.776	55	11	LOW
	Javier, Stan	31	109	419	0.747	62	11	LOW
	Johnson, Lance	31	106	412	0.714	53	12	HIGH
	Kingery, Mike	34	105	301	0.933	62	12	LOW
	MacFarland, Mike	31	92	314	0.821	53	11	HIGH
	McGriff, Fred	31	113	424	1.012	102	22	HIGH
	Molitor, Paul	38	115	434	0.927	100	19	LOW
	Morris, Hal	30	112	436	0.875	79	15	HIGH
	Nixon, Otis	36	103	398	0.677	56	10	LOW
	Phillips, Tony	36	114	438	0.877	90	16	LOW
	Reed, Jody	32	108	399	0.703	52	12	LOW
	Velarde, Randy	32	77	280	0.777	40	8	HIGH
	Weiss, Walt	31	110	423	0.639	46	7	LOW
	White, Devon	32	100	483	0.77	58	11	LOW
1996	Alou, Moises	29	93	344	0.801	97	11	LOW
	Belle, Albert	29	143	546	1.091	143	30	HIGH
	Bordick, Mike	30	126	428	0.675	50	10	LOW
	DeShields, Delino	27	127	425	0.722	61	16	LOW
	Girardi, Joe	31	125	462	0.667	48	10	LOW
	McLemore, Mark	31	129	467	0.703	59	11	LOW

	Naehring, Tim	29	126	433	0.863	80	17	LOW
	Steinbach, Terry	34	114	406	0.78	54	16	LOW
1997	Anderson, Brady	33	149	579	1.034	149	28	LOW
	Bell, Jay	31	151	527	0.714	67	15	LOW
	Blauser, Jeff	31	83	265	0.775	41	9	HIGH
	Boggs, Wade	39	132	501	0.778	78	15	HIGH
	Fletcher, Darrin	30	127	394	0.735	50	8	LOW
	Galarraga, Andres	36	159	626	0.958	135	25	LOW
	Javier, Stan	33	71	274	0.719	38	5	LOW
	Lofton, Kenny	30	154	662	0.817	121	23	HIGH
	Martinez, Dave	32	146	440	0.861	84	16	LOW
	Olerud, John	28	125	398	0.854	73	10	LOW
	Reed, Jody	34	116	341	0.784	52	9	LOW
	Segui, David	30	115	416	0.818	70	15	LOW
	Sorrento, Paul	31	143	471	0.878	88	15	LOW
	Weiss, Walt	33	155	517	0.756	81	8	LOW
1998	Alomar, Roberto	30	112	412	0.89	81	21	HIGH
	Belle, Albert	31	161	634	0.823	95	18	LOW
	Berry, Sean	32	96	301	0.739	38	5	LOW
	Brosius, Scott	31	129	479	0.576	39	5	LOW
	Caminiti, Ken	35	137	486	0.897	99	26	LOW
	Clark, Will	34	110	393	0.896	80	14	LOW
	DeShields, Delino	29	150	572	0.804	100	21	LOW
	Finley, Steve	33	143	560	0.788	84	19	LOW
	Offerman, Jose	29	106	424	0.753	59	9	LOW
	Palmeiro, Rafael	33	158	614	0.815	97	18	HIGH
	Surhoff, B.J.	33	147	528	0.803	85	19	HIGH
	Rodriguez, Henry	30	132	476	0.785	68	16	LOW
	Vaughn, Mo	30	141	527	0.98	125	22	LOW
	White, Devon	35	74	265	0.707	36	9	HIGH
	Williams, Bernie	29	129	509	0.952	115	24	HIGH
1999	Conine, Jeff	33	93	309	0.729	40	6	LOW
	Gutierrez, Ricky	29	141	491	0.671	54	12	HIGH
	Mayne, Brent	31	94	275	0.719	36	9	LOW
	McLemore, Mark	34	126	461	0.686	59	12	LOW
	Olerud, John	30	160	557	0.998	140	34	LOW
	Sanchez, Rey	31	109	316	0.686	35	8	LOW
	Vaughn, Greg	33	158	573	0.96	127	30	HIGH
	Williams, Gerald	32	129	266	0.856	46	12	HIGH
2000	Burks, Ellis	35	120	390	0.964	88	24	LOW
	Grace, Mark	36	161	593	0.87	113	21	LOW
	Ramirez, Manny	28	147	522	1.105	155	35	HIGH
	Rodriguez, Alex	24	129	502	0.943	104	23	LOW
	Valentin, Jose	30	89	256	0.765	40	8	LOW
2001	Alou, Moises	34	126	454	1.039	111	17	LOW
	Bonds, Barry	36	143	480	1.127	154	32	HIGH
	Cedeno, Roger	26	74	259	0.781	42	5	LOW
	Damon, Johnny	27	159	655	0.877	134	26	LOW
	Giambi, Jason	30	152	510	1.123	169	38	HIGH
	Gutierrez, Ricky	31	125	449	0.775	72	15	LOW
	Lopez, Javier	30	134	481	0.822	72	16	HIGH
	Martinez, Tino	33	155	569	0.749	77	12	LOW
	McLemore, Mark	36	138	481	0.669	59	13	HIGH
	Paquette, Craig	32	134	384	0.728	49	8	HIGH
	Young, Eric	34	153	607	0.766	100	18	LOW
2002	Alfonso, Edgardo	28	124	457	0.725	130	15	LOW

	Finley, Steve	37	140	495	0.767	71	15	HIGH
	Grissom, Marquis	35	135	448	0.654	40	6	LOW
	Kent, Jeff	34	159	607	0.877	115	27	HIGH
	Olerud, John	33	159	572	0.873	108	21	HIGH
	Thome, Jim	31	156	526	1.04	139	31	HIGH
2003	Ausmus, Brad	34	130	147	0.765	43	9	LOW
	Batista, Tony	29	161	615	0.766	84	16	LOW
	Cameron, Mike	30	158	545	0.782	87	19	HIGH
	Castillo, Luis	27	146	606	0.726	86	19	LOW
	Cruz Jr., Jose	29	124	466	0.754	66	14	LOW
	Guerrero, Vladimir	27	161	614	1.01	146	29	LOW
	Ibanez, Raul	31	137	497	0.883	89	13	LOW
	Lopez, Javier	32	109	347	0.67	35	10	HIGH
	McLemore, Mark	38	104	337	0.774	55	13	HIGH
	Palmeiro, Rafael	38	155	546	0.962	126	19	LOW
	Sheffield, Gary	34	135	492	0.916	104	26	HIGH
	Spiezio, Scott	30	153	491	0.807	79	17	HIGH
	Tejada, Miguel	27	162	662	0.861	113	32	HIGH
	Tucker, Michael	32	144	475	0.737	67	8	LOW

APPENDIX B

Option Year Performance Data Set

Year	Name	Games	AB	Option OPS	Option RC	Option WS	Option W%
1976	Bando, Sal	158	550	0.762	84	24	LOW
	Baylor, Don	157	595	0.697	80	19	LOW
	Campaneris, Bert	149	536	0.622	64	19	LOW
	Cash, Dave	160	666	0.683	75	21	HIGH
	Fuentes, Tito	135	520	0.597	45	9	LOW
	Hebner, Richie	132	434	0.692	53	12	HIGH
	Jackson, Reggie	134	498	0.853	85	25	LOW
	Matthews, Gary	156	587	0.802	97	24	LOW
	Tenace, Gene	128	417	0.831	75	22	LOW
1977	Gamble, Oscar	137	408	0.974	95	22	HIGH
	Hisle, Larry	141	546	0.902	106	24	LOW
	Zisk, Richie	141	531	0.869	93	20	HIGH
1978	Evans, Darrell	159	547	0.764	86	26	LOW
	Rose, Pete	159	655	0.783	102	27	HIGH
	Thomas, Derrel	128	352	0.594	34	7	LOW
1979	Morgan, Joe	127	436	0.756	72	18	HIGH
	Office, Rowland	124	277	0.656	30	5	LOW
	Patek, Freddie	106	306	0.610	26	3	LOW
	Perez, Tony	132	489	0.748	64	14	HIGH
	Stennett, Rennie	108	319	0.581	24	5	HIGH
1980	LeFlore, Ron	139	521	0.700	78	18	HIGH
	Winfield, Dave	162	558	0.815	94	22	LOW
1981	Burroughs, Jeff	89	319	0.734	42	8	LOW
	Collins, Dave	95	360	0.735	52	14	HIGH
	Fisk, Carlton	96	338	0.715	45	13	LOW
	Jackson, Reggie	94	334	0.758	46	10	HIGH
	Speier, Tony	96	307	0.600	27	8	HIGH
1982	Almon, Bill	111	308	0.667	33	8	LOW
	Ashby, Alan	100	339	0.727	43	11	LOW
	Baylor, Don	157	608	0.754	83	13	HIGH
	Cowens, Al	146	560	0.800	83	17	LOW
	Garvey, Steve	162	625	0.718	76	15	LOW
	Kemp, Steve	160	580	0.808	98	22	LOW
	McRae, Hal	159	613	0.910	122	26	HIGH
1983	Cabell, Enos	121	392	0.769	50	10	HIGH
	Carew, Rod	129	172	0.820	77	16	LOW
	Evans, Darrell	142	523	0.894	103	28	LOW
	Simmons, Ted	153	600	0.799	88	20	LOW
1984	Lacy, Lee	138	474	0.826	77	18	LOW
	Lynn, Fred	142	517	0.840	89	22	LOW
	Thornton, Andre	155	587	0.850	107	21	LOW
1985	Beniquez, Juan	132	411	0.782	59	13	HIGH
	Bernazard, Tony	153	500	0.765	75	17	LOW
	Bochte, Bruce	137	424	0.806	66	17	LOW
	Fisk, Carlton	153	543	0.808	84	24	LOW
	Gibson, Kirk	154	581	0.882	117	24	LOW
	Grich, Bobby	144	479	0.727	62	18	HIGH

	McRae, Hal	112	320	0.799	48	8	HIGH
1986	Boone, Bob	144	442	0.593	39	10	HIGH
	Concepcion, Dave	90	311	0.658	33	8	LOW
	Dawson, Andre	130	496	0.815	75	16	LOW
	DeCinces, Doug	140	512	0.784	71	16	HIGH
	Downing, Brian	152	513	0.841	94	23	HIGH
	Jackson, Reggie	132	419	0.787	66	13	HIGH
	Knight, Ray	137	486	0.775	69	17	HIGH
	Parrish, Lance	91	327	0.824	55	15	LOW
	Raines, Tim	151	580	0.889	131	32	LOW
	Randolph, Willie	141	492	0.738	76	18	HIGH
	Ward, Gary	105	380	0.777	55	14	LOW
	Whitt, Ernie	131	395	0.774	55	13	LOW
1987	Butler, Brett	137	522	0.825	97	20	LOW
	Davis, Chili	149	500	0.786	77	16	HIGH
	Davis, Mike	139	494	0.788	72	14	LOW
	Gaetti, Gary	154	584	0.788	75	17	LOW
	Hubbard, Glenn	141	433	0.760	66	15	LOW
	Law, Vance	133	436	0.769	64	16	HIGH
	Molitor, Paul	118	465	1.003	126	29	HIGH
1988	Bush, Randy	136	394	0.799	64	14	HIGH
	Evans, Darrell	144	437	0.717	56	11	LOW
	Ganter, Jim	155	539	0.658	60	14	LOW
	Marshall, Mike	144	542	0.758	70	19	HIGH
	Sax, Steve	160	632	0.668	74	24	HIGH
	Templeton, Gary	110	362	0.639	36	12	LOW
1989	Backman, Wally	87	299	0.591	27	4	LOW
	Brooks, Hubie	148	542	0.721	64	13	LOW
	Hall, Mel	113	361	0.721	44	8	LOW
	Hrbek, Kent	109	375	0.878	72	18	LOW
	Moseby, Lloyd	135	502	0.655	57	12	LOW
	O'Brien, Pete	155	554	0.727	76	14	LOW
	Parker, Dave	144	553	0.741	67	15	HIGH
	Pena, Tony	141	424	0.655	41	10	LOW
	Pettis, Gary	119	444	0.684	58	10	LOW
	Yount, Robin	160	614	0.896	125	34	LOW
1990	Bell, George	142	562	0.724	69	12	LOW
	Butler, Brett	160	622	0.781	108	27	LOW
	Clark, Jack	115	334	0.974	82	17	LOW
	Coleman, Vince	124	497	0.741	75	14	LOW
	Daulton, Darren	143	459	0.783	75	23	LOW
	Davis, Chili	113	412	0.755	57	10	LOW
	Deer, Rob	134	440	0.745	62	15	LOW
	Gaetti, Gary	154	577	0.650	55	13	LOW
	Gibson, Kirk	89	315	0.745	50	14	LOW
	Pendleton, Terry	121	447	0.601	38	5	LOW
	Strawberry, Darryl	152	542	0.879	103	26	HIGH
	Tettleton, Mickey	135	444	0.756	69	16	LOW
	Wilson, Willie	115	307	0.725	44	11	LOW
1991	Bonilla, Bobby	157	577	0.883	113	31	HIGH
	Duncan, Mariano	100	333	0.699	40	10	LOW
	Gladden, Dan	126	461	0.662	48	7	HIGH
	Harper, Brian	123	441	0.783	62	15	HIGH
	Joyner, Wally	143	551	0.848	97	25	LOW
	Lavalliere, Mike	108	336	0.711	42	12	HIGH
	Murray, Eddie	153	576	0.724	72	16	HIGH

	Stillwell, Kurt	122	385	0.683	44	10	LOW
	Tartabull, Danny	132	484	0.990	114	28	LOW
	Thon, Dickie	146	539	0.634	52	12	LOW
1992	Boggs, Wade	143	514	0.711	67	15	LOW
	Bonds, Barry	140	473	1.080	148	41	HIGH
	Carter, Joe	158	622	0.808	93	24	HIGH
	Davis, Chili	138	444	0.825	77	14	HIGH
	Dawson, Andre	143	542	0.772	75	16	LOW
	Felder, Mike	145	322	0.712	43	10	LOW
	Gagne, Greg	146	439	0.626	39	13	HIGH
	Molitor, Paul	158	609	0.851	116	28	HIGH
	Orsulak, Joe	117	391	0.723	52	12	LOW
	Owen, Spike	122	386	0.729	53	14	LOW
	Puckett, Kirby	160	639	0.864	113	31	HIGH
	Santiago, Benito	106	386	0.671	37	7	LOW
	Smith, Ozzie	132	518	0.708	72	20	LOW
	Steinbach, Terry	128	438	0.756	57	20	HIGH
	Whitaker, Lou	130	453	0.847	84	24	LOW
1993	Clark, Will	132	491	0.799	79	15	HIGH
	Murray, Eddie	154	610	0.792	85	15	LOW
	Nixon, Otis	134	461	0.666	58	13	HIGH
	Palmeiro, Rafael	160	597	0.926	128	31	LOW
	Polonia, Luis	152	576	0.654	65	11	LOW
	Raines, Tim	115	415	0.880	84	19	HIGH
	Weiss, Walt	158	500	0.675	62	13	LOW
1994	Blauser, Jeff	96	380	0.710	47	10	HIGH
	Buhner, Jay	101	358	0.936	79	13	LOW
	Jefferies, Gregg	103	397	0.880	76	17	LOW
	McLemore, Mark	104	343	0.674	43	9	HIGH
	Pendleton, Terry	77	309	0.678	32	6	HIGH
	Walker, Larry	103	395	0.981	92	21	HIGH
1995	Alomar, Roberto	130	517	0.803	84	16	LOW
	Biggio, Craig	141	553	0.889	121	29	LOW
	Boggs, Wade	126	460	0.834	82	18	LOW
	Conseco, Jose	102	396	0.933	83	15	HIGH
	Gagne, Greg	120	430	0.690	49	10	LOW
	Henderson, Rickey	112	407	0.855	81	19	LOW
	Javier, Stan	130	442	0.740	67	13	LOW
	Johnson, Lance	142	607	0.766	93	18	LOW
	Kingery, Mike	119	350	0.762	52	7	LOW
	MacFarland, Mike	115	364	0.723	47	8	HIGH
	McGriff, Fred	144	528	0.850	88	20	HIGH
	Molitor, Paul	130	525	0.772	82	12	LOW
	Morris, Hal	101	359	0.785	51	7	HIGH
	Nixon, Otis	139	589	0.695	77	13	LOW
	Phillips, Tony	139	525	0.853	101	19	LOW
	Reed, Jody	131	445	0.676	53	14	LOW
	Velarde, Randy	111	367	0.768	57	13	LOW
	Weiss, Walt	137	427	0.724	65	12	LOW
	White, Devon	101	427	0.765	63	12	LOW
1996	Alou, Moises	143	540	0.797	52	20	LOW
	Belle, Albert	158	602	1.033	154	31	HIGH
	Bordick, Mike	155	525	0.625	52	10	LOW
	DeShields, Delino	154	581	0.585	54	11	HIGH
	Girardi, Joe	124	422	0.720	55	11	HIGH
	McLemore, Mark	147	517	0.768	81	16	HIGH

	Naehring, Tim	116	430	0.808	68	13	LOW
	Steinbach, Terry	145	514	0.871	88	18	LOW
1997	Anderson, Brady	151	590	0.863	116	26	HIGH
	Bell, Jay	153	573	0.829	98	21	LOW
	Blauser, Jeff	151	519	0.886	105	27	HIGH
	Boggs, Wade	104	353	0.769	55	10	HIGH
	Fletcher, Darrin	96	310	0.836	50	10	LOW
	Galarraga, Andres	154	600	0.974	132	20	LOW
	Javier, Stan	142	440	0.764	72	17	HIGH
	Lofton, Kenny	122	493	0.837	86	21	HIGH
	Martinez, Dave	145	504	0.768	77	15	LOW
	Olerud, John	154	524	0.889	104	27	LOW
	Reed, Jody	90	256	0.921	52	11	LOW
	Segui, David	125	459	0.886	89	16	LOW
	Sorrento, Paul	146	457	0.859	77	11	HIGH
	Weiss, Walt	121	393	0.761	61	13	LOW
1998	Alomar, Roberto	147	588	0.765	88	19	LOW
	Belle, Albert	163	609	1.055	157	37	LOW
	Berry, Sean	102	299	0.895	59	12	HIGH
	Brosius, Scott	152	530	0.843	95	27	HIGH
	Caminiti, Ken	131	452	0.862	85	20	HIGH
	Clark, Will	149	554	0.891	108	19	LOW
	DeShields, Delino	117	120	0.799	71	15	LOW
	Finley, Steve	159	619	0.702	75	15	HIGH
	Offerman, Jose	158	607	0.841	119	29	LOW
	Palmeiro, Rafael	162	619	0.945	131	24	LOW
	Surhoff, B.J.	162	573	0.789	84	13	LOW
	Rodriguez, Henry	128	415	0.864	73	16	HIGH
	Vaughn, Mo	54	609	0.993	142	25	HIGH
	White, Devon	146	563	0.792	87	18	LOW
	Williams, Bernie	128	499	0.997	116	27	HIGH
1999	Conine, Jeff	139	444	0.787	64	10	LOW
	Gutierrez, Ricky	85	268	0.690	31	6	HIGH
	Mayne, Brent	117	322	0.808	50	13	LOW
	McLemore, Mark	144	566	0.729	81	15	HIGH
	Olerud, John	162	581	0.890	120	26	HIGH
	Sanchez, Rey	134	479	0.698	56	12	LOW
	Vaughn, Greg	153	550	0.881	106	24	HIGH
	Williams, Gerald	143	422	0.792	63	13	HIGH
2000	Burks, Ellis	122	393	1.025	101	21	HIGH
	Grace, Mark	143	510	0.824	94	18	LOW
	Ramirez, Manny	118	439	1.154	142	27	HIGH
	Rodriguez, Alex	148	545	1.026	148	37	HIGH
	Valentin, Jose	144	568	0.835	98	24	HIGH
2001	Alou, Moises	136	513	0.949	109	21	HIGH
	Bonds, Barry	153	476	1.379	228	54	HIGH
	Cedeno, Roger	131	523	0.733	76	14	LOW
	Damon, Johnny	155	644	0.687	79	17	HIGH
	Giambi, Jason	154	520	1.137	169	38	HIGH
	Gutierrez, Ricky	147	528	0.746	74	16	LOW
	Lopez, Javier	128	438	0.747	58	13	LOW
	Martinez, Tino	154	589	0.830	93	21	HIGH
	McLemore, Mark	125	409	0.790	74	18	HIGH
	Paquette, Craig	123	340	0.791	48	12	HIGH
	Young, Eric	149	603	0.726	78	16	LOW
2002	Alfonso, Edgardo	135	490	0.851	62	25	LOW

	Finley, Steve	150	505	0.869	95	23	HIGH
	Grissom, Marquis	111	343	0.831	55	15	HIGH
	Kent, Jeff	152	623	0.933	124	29	HIGH
	Olerud, John	154	553	0.893	112	27	HIGH
	Thome, Jim	147	480	1.122	152	34	LOW
2003	Ausmus, Brad	143	150	0.594	41	12	LOW
	Batista, Tony	161	631	0.663	61	11	LOW
	Cameron, Mike	147	534	0.774	79	21	HIGH
	Castillo, Luis	152	595	0.778	91	22	HIGH
	Cruz Jr., Jose	158	539	0.779	83	17	HIGH
	Guerrero, Vladimir	112	394	1.012	94	18	LOW
	Ibanez, Raul	157	608	0.799	96	15	LOW
	Lopez, Javier	129	157	1.065	114	30	HIGH
	McLemore, Mark	99	309	0.632	32	8	HIGH
	Palmeiro, Rafael	154	561	0.867	106	19	LOW
	Sheffield, Gary	155	576	1.023	149	35	HIGH
	Spiezio, Scott	158	521	0.779	76	12	LOW
	Tejada, Miguel	162	636	0.807	102	25	HIGH
	Tucker, Michael	104	389	0.771	53	9	LOW

APPENDIX C

Post-Option Year Performance Data Set

Year	Name	Games	AB	Post-OPS	Post-RC	Post-WS	Post-W%
1976	Bando, Sal	159	580	0.731	79	17	LOW
	Baylor, Don	154	561	0.768	81	16	LOW
	Campaneris, Bert	150	552	0.655	60	15	HIGH
	Cash, Dave	153	650	0.719	82	17	LOW
	Fuentes, Tito	151	615	0.745	84	16	LOW
	Hebner, Richie	118	397	0.864	73	16	HIGH
	Jackson, Reggie	146	525	0.925	115	27	HIGH
	Matthews, Gary	148	555	0.799	89	16	LOW
	Tenace, Gene	147	437	0.824	85	25	LOW
1977	Gamble, Oscar	126	375	0.753	56	15	LOW
	Hisle, Larry	142	520	0.906	102	23	HIGH
	Zisk, Richie	140	511	0.770	73	15	LOW
1978	Evans, Darrell	160	562	0.748	82	23	LOW
	Rose, Pete	163	628	0.848	115	27	LOW
	Thomas, Derrel	141	406	0.679	49	10	LOW
1979	Morgan, Joe	141	461	0.740	73	21	HIGH
	Office, Rowland	116	292	0.744	41	9	HIGH
	Patek, Freddie	86	273	0.694	28	5	LOW
	Perez, Tony	151	585	0.786	79	13	LOW
	Stennett, Rennie	120	397	0.588	32	6	LOW
1980	LeFlore, Ron	82	337	0.604	78	5	LOW
	Winfield, Dave	105	388	0.824	65	16	HIGH
1981	Burroughs, Jeff	113	285	0.878	53	14	LOW
	Collins, Dave	111	348	0.646	37	5	LOW
	Fisk, Carlton	135	476	0.740	66	19	LOW
	Jackson, Reggie	153	530	0.907	105	22	HIGH
	Speier, Tony	156	530	0.677	57	14	LOW
1982	Almon, Bill	143	451	0.663	51	10	LOW
	Ashby, Alan	87	275	0.692	30	6	LOW
	Baylor, Don	144	534	0.856	96	21	HIGH
	Cowens, Al	110	356	0.584	28	1	LOW
	Garvey, Steve	100	388	0.802	57	14	LOW
	Kemp, Steve	109	373	0.718	44	8	HIGH
	McRae, Hal	157	589	0.833	97	20	LOW
1983	Cabell, Enos	127	436	0.758	56	12	LOW
	Carew, Rod	93	329	0.720	44	9	LOW
	Evans, Darrell	131	401	0.737	57	12	HIGH
	Simmons, Ted	132	497	0.569	36	1	LOW
1984	Lacy, Lee	121	492	0.752	69	14	LOW
	Lynn, Fred	124	448	0.787	69	16	LOW
	Thornton, Andre	124	461	0.711	55	8	LOW
1985	Beniquez, Juan	113	343	0.769	50	10	LOW
	Bernazard, Tony	146	562	0.818	96	25	LOW
	Bochte, Bruce	125	407	0.694	51	11	LOW
	Fisk, Carlton	125	457	0.600	38	6	LOW
	Gibson, Kirk	119	441	0.863	87	20	LOW
	Grich, Bobby	98	313	0.766	45	11	HIGH

	McRae, Hal	112	278	0.675	29	2	LOW
1986	Boone, Bob	128	389	0.615	37	10	LOW
	Concepcion, Dave	104	279	0.761	39	8	LOW
	Dawson, Andre	153	621	0.896	110	20	LOW
	DeCinces, Doug	133	453	0.728	60	12	LOW
	Downing, Brian	155	567	0.886	116	23	LOW
	Jackson, Reggie	115	336	0.699	41	6	LOW
	Knight, Ray	150	563	0.683	62	11	LOW
	Parrish, Lance	130	466	0.712	52	10	LOW
	Raines, Tim	139	530	0.955	133	34	HIGH
	Randolph, Willie	120	449	0.825	82	22	LOW
	Ward, Gary	146	529	0.675	55	7	LOW
	Whitt, Ernie	135	446	0.789	63	16	HIGH
1987	Butler, Brett	157	568	0.791	99	27	LOW
	Davis, Chili	158	600	0.757	80	22	HIGH
	Davis, Mike	108	281	0.530	20	2	HIGH
	Gaetti, Gary	133	468	0.905	89	22	HIGH
	Hubbard, Glenn	105	294	0.674	33	11	HIGH
	Law, Vance	151	556	0.770	79	20	LOW
	Molitor, Paul	154	609	0.836	112	27	LOW
1988	Bush, Randy	141	391	0.782	53	13	LOW
	Evans, Darrell	107	276	0.658	32	5	LOW
	Ganter, Jim	116	409	0.654	45	12	LOW
	Marshall, Mike	105	377	0.733	48	11	LOW
	Sax, Steve	158	651	0.751	92	21	LOW
	Templeton, Gary	142	506	0.639	46	11	LOW
1989	Backman, Wally	104	315	0.771	49	12	HIGH
	Brooks, Hubie	153	568	0.732	70	14	LOW
	Hall, Mel	113	360	0.706	40	7	LOW
	Hrbek, Kent	143	492	0.850	88	19	LOW
	Moseby, Lloyd	122	431	0.735	57	11	LOW
	O'Brien, Pete	108	366	0.622	35	2	LOW
	Parker, Dave	157	610	0.781	85	15	LOW
	Pena, Tony	143	491	0.670	50	15	LOW
	Pettis, Gary	136	423	0.668	52	11	LOW
	Yount, Robin	158	587	0.717	80	18	LOW
1990	Bell, George	149	558	0.791	81	14	LOW
	Butler, Brett	161	615	0.744	93	26	HIGH
	Clark, Jack	140	481	0.840	84	15	LOW
	Coleman, Vince	72	278	0.674	36	7	LOW
	Daulton, Darren	89	285	0.662	33	9	LOW
	Davis, Chili	153	534	0.892	106	22	HIGH
	Deer, Rob	134	448	0.700	58	11	LOW
	Gaetti, Gary	152	586	0.672	62	14	LOW
	Gibson, Kirk	132	462	0.744	67	12	LOW
	Pendleton, Terry	153	586	0.880	107	27	HIGH
	Strawberry, Darryl	139	505	0.852	90	24	HIGH
	Tettleton, Mickey	154	501	0.878	97	27	LOW
	Wilson, Willie	113	294	0.603	26	5	LOW
1991	Bonilla, Bobby	128	438	0.779	65	18	LOW
	Duncan, Mariano	142	574	0.680	63	12	LOW
	Gladden, Dan	113	417	0.661	45	8	LOW
	Harper, Brian	140	502	0.753	68	12	HIGH
	Joyner, Wally	149	572	0.723	72	14	LOW
	Lavalliere, Mike	95	293	0.677	33	11	HIGH
	Murray, Eddie	156	551	0.759	78	20	LOW

	Stillwell, Kurt	114	379	0.572	31	4	LOW
	Tartabull, Danny	123	421	0.898	89	23	LOW
	Thon, Dickie	95	275	0.661	32	9	LOW
1992	Boggs, Wade	143	560	0.740	80	20	LOW
	Bonds, Barry	159	539	1.136	172	47	HIGH
	Carter, Joe	155	603	0.802	92	17	HIGH
	Davis, Chili	153	573	0.767	79	16	LOW
	Dawson, Andre	121	461	0.738	57	7	LOW
	Felder, Mike	109	342	0.531	25	2	LOW
	Gagne, Greg	159	540	0.724	66	18	LOW
	Molitor, Paul	160	636	0.911	135	29	HIGH
	Orsulak, Joe	134	409	0.730	53	8	LOW
	Owen, Spike	103	334	0.605	31	5	LOW
	Puckett, Kirby	156	622	0.824	99	18	LOW
	Santiago, Benito	139	469	0.671	50	8	LOW
	Smith, Ozzie	141	545	0.693	68	19	LOW
	Steinbach, Terry	104	389	0.749	50	9	LOW
	Whitaker, Lou	119	383	0.861	76	19	LOW
1993	Clark, Will	110	389	0.932	90	19	LOW
	Murray, Eddie	108	433	0.727	54	9	HIGH
	Nixon, Otis	103	398	0.677	56	10	LOW
	Palmeiro, Rafael	111	436	0.942	94	17	HIGH
	Polonia, Luis	95	350	0.797	56	12	HIGH
	Raines, Tim	101	384	0.774	62	14	HIGH
	Weiss, Walt	110	423	0.639	46	7	LOW
1994	Blauser, Jeff	115	431	0.660	49	10	HIGH
	Buhner, Jay	126	470	0.909	87	16	LOW
	Jefferies, Gregg	114	480	0.797	72	10	LOW
	McLemore, Mark	129	467	0.703	59	11	LOW
	Pendleton, Terry	133	513	0.778	75	17	LOW
	Walker, Larry	131	494	0.988	114	18	LOW
1995	Alomar, Roberto	153	588	0.938	131	31	LOW
	Biggio, Craig	162	605	0.801	106	32	LOW
	Boggs, Wade	132	501	0.778	78	15	HIGH
	Conseco, Jose	96	360	0.989	87	13	LOW
	Gagne, Greg	128	428	0.698	53	20	HIGH
	Henderson, Rickey	148	465	0.754	80	16	HIGH
	Javier, Stan	71	274	0.719	38	5	LOW
	Johnson, Lance	160	682	0.841	122	26	LOW
	Kingery, Mike	117	276	0.641	28	3	LOW
	MacFarland, Mike	112	379	0.838	64	13	LOW
	McGriff, Fred	159	617	0.859	107	19	HIGH
	Molitor, Paul	161	660	0.858	118	18	LOW
	Morris, Hal	142	528	0.853	93	18	LOW
	Nixon, Otis	125	496	0.703	71	12	LOW
	Phillips, Tony	153	581	0.803	103	21	LOW
	Reed, Jody	146	495	0.622	47	11	HIGH
	Velarde, Randy	136	530	0.799	86	17	LOW
	Weiss, Walt	155	517	0.756	81	8	LOW
	White, Devon	146	552	0.779	83	18	LOW
1996	Alou, Moises	150	538	0.866	81	23	HIGH
	Belle, Albert	161	634	0.823	95	18	LOW
	Bordick, Mike	153	509	0.601	41	7	HIGH
	DeShields, Delino	150	572	0.804	100	21	LOW
	Girardi, Joe	112	398	0.645	38	9	HIGH
	McLemore, Mark	89	349	0.668	41	5	LOW

	Naehring, Tim	70	259	0.843	44	7	LOW
	Steinbach, Terry	122	447	0.696	51	7	LOW
1997	Anderson, Brady	133	479	0.776	78	13	LOW
	Bell, Jay	155	549	0.785	83	20	LOW
	Blauser, Jeff	119	361	0.639	40	6	HIGH
	Boggs, Wade	123	435	0.748	59	6	LOW
	Fletcher, Darrin	124	407	0.738	50	11	LOW
	Galarraga, Andres	153	555	0.991	132	27	HIGH
	Javier, Stan	135	417	0.759	64	12	LOW
	Lofton, Kenny	154	600	0.785	105	21	LOW
	Martinez, Dave	90	309	0.655	33	3	LOW
	Olerud, John	160	557	0.998	140	34	LOW
	Reed, Jody	113	259	0.844	46	8	LOW
	Segui, David	143	522	0.845	90	15	LOW
	Sorrento, Paul	137	435	0.718	55	4	LOW
	Weiss, Walt	96	347	0.729	52	12	HIGH
1998	Alomar, Roberto	159	563	0.955	138	35	HIGH
	Belle, Albert	161	610	0.941	134	24	LOW
	Berry, Sean	106	259	0.582	22	1	LOW
	Brosius, Scott	133	473	0.722	59	13	HIGH
	Caminiti, Ken	78	273	0.862	53	10	HIGH
	Clark, Will	77	251	0.877	49	8	LOW
	DeShields, Delino	96	330	0.702	41	7	LOW
	Finley, Steve	156	590	0.861	106	24	HIGH
	Offerman, Jose	149	586	0.826	104	19	HIGH
	Palmeiro, Rafael	158	565	1.050	151	31	HIGH
	Surhoff, B.J.	162	673	0.839	113	17	LOW
	Rodriguez, Henry	130	447	0.925	90	17	LOW
	Vaughn, Mo	139	524	0.866	94	19	LOW
	White, Devon	134	474	0.744	66	12	LOW
	Williams, Bernie	158	591	0.971	139	33	HIGH
1999	Conine, Jeff	119	409	0.779	58	9	LOW
	Gutierrez, Ricky	125	449	0.775	72	15	LOW
	Mayne, Brent	117	335	0.799	52	8	LOW
	McLemore, Mark	138	481	0.669	59	13	HIGH
	Olerud, John	159	565	0.831	100	22	HIGH
	Sanchez, Rey	143	509	0.637	49	9	LOW
	Vaughn, Greg	127	461	0.864	87	16	LOW
	Williams, Gerald	146	632	0.739	82	14	LOW
2000	Burks, Ellis	124	439	0.911	87	15	HIGH
	Grace, Mark	145	476	0.852	89	16	HIGH
	Ramirez, Manny	142	529	1.014	130	25	LOW
	Rodriguez, Alex	162	632	1.021	158	37	LOW
	Valentin, Jose	124	438	0.845	74	15	LOW
2001	Alou, Moises	132	484	0.757	67	9	LOW
	Bonds, Barry	143	403	1.381	206	49	HIGH
	Cedeno, Roger	149	511	0.664	59	10	LOW
	Damon, Johnny	154	623	0.799	107	21	HIGH
	Giambi, Jason	155	560	1.034	148	34	HIGH
	Gutierrez, Ricky	94	353	0.671	37	8	LOW
	Lopez, Javier	109	347	0.670	35	10	HIGH
	Martinez, Tino	150	511	0.776	75	15	HIGH
	McLemore, Mark	104	337	0.774	55	13	HIGH
	Paquette, Craig	72	252	0.528	16	1	LOW
	Young, Eric	138	496	0.707	63	9	LOW
2002	Alfonso, Edgardo	147	514	0.726	93	17	HIGH

	Finley, Steve	147	516	0.863	95	18	LOW
	Grissom, Marquis	149	587	0.790	85	22	HIGH
	Kent, Jeff	130	505	0.860	87	20	LOW
	Olerud, John	152	539	0.761	78	15	HIGH
	Thome, Jim	159	578	0.958	132	30	LOW
2003	Ausmus, Brad	129	403	0.631	38	6	HIGH
	Batista, Tony	157	606	0.728	71	13	LOW
	Cameron, Mike	140	493	0.798	78	18	LOW
	Castillo, Luis	150	564	0.720	78	22	LOW
	Cruz Jr., Jose	153	545	0.766	82	15	LOW
	Guerrero, Vladimir	156	612	0.989	139	29	HIGH
	Ibanez, Raul	123	481	0.825	78	13	LOW
	Lopez, Javier	150	579	0.872	104	19	LOW
	McLemore, Mark	77	250	0.683	31	6	HIGH
	Palmeiro, Rafael	154	550	0.796	88	13	LOW
	Sheffield, Gary	154	573	0.927	120	31	HIGH
	Spiezio, Scott	112	367	0.634	38	4	LOW
	Tejada, Miguel	162	653	0.894	120	30	LOW
	Tucker, Michael	140	464	0.765	72	15	HIGH

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EDUCATION HONORS

- Nominated for membership to *The Chancellor's List* National Honor Society, the highest academic honor to which graduate students can aspire (2004)

- Nominated for membership to *Pi Lambda Theta* International Honor Society & Professional Association in Education (2003)

- Awarded *Presidential Scholarship* for academic excellence

- Awarded *OMH Corporation Scholarship* for outstanding leadership and academic achievement

- Dean' s List