Playing Not to Lose: Loss Aversion in Basketball and Professional Sports

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Abstract

The following analysis examines the concept of loss aversion, specifically in the realm of professional basketball. I study the existing literature on prospect theory, reference dependent preferences and loss aversion, and analyze how these theories affect a player's motivations for in-game performance. I also explore the various channels of influence that may have an effect on player expectation, which in turn affects his exertion of effort. Of the many avenues that potentially influence player's expectations for his wages, I focus on 'clutch' performance and how the posited enhanced difficulty in those situations may affect player behavior.

I. Introduction

In most markets, agents face trade-offs between the exertion of costly effort and the rewards of better performance. Many studies find that individuals exert more effort if they feel they have yet to achieve an internal, often arbitrary standard. This phenomenon is known as loss aversion—individuals place a more significant psychological weight on losses than gains—and the standard against which these losses and gains are measured is known as a reference point (Kahneman and Tversky 1979). The existence of inconsistencies in people's value functions suggests that they undergo irrational behavioral changes under different circumstances. If we make the assumption that an individual's behavioral patterns can be suitably charted on a Cartesian plane as a value function, the changes in these patterns would be represented by any deviations from linearity in the value function, including kinks, changes in slopes, and discontinuities. While we recognize that the idiosyncrasies of these value functions represent reference points, the ways in which they are formed is somewhat unclear.

The following analysis turns to professional sports to act as a conduit for our pursuit of these explanations. More specifically, this analysis focuses on professional basketball, and how players in the National Basketball Association (NBA) alter their behavior consciously and subconsciously as a result of their changing reference points. Section II discusses the studies conducted on utility and behavior and examines the ways in which the literature on the subject has evolved over time. Section III features a critique of the literature and discusses the ways in which previous studies have been limited. Section IV discusses the avenues that the current work on loss aversion within the realm of professional basketball can pursue. Section V loosely constructs an experiment that tests for the ways in which player behavior (in the context of loss aversion) in the NBA is affected by a very specific in-game situation, 'clutch' performance. Section VI features concluding remarks.

II. Literature Review

II.A. Expected Utility Theory

Before we begin to explicate the concept of loss aversion, we must first view this phenomenon within the broader frameworks of the trends in individual behavior. Expected utility theory dominated the economic analysis of decision-making under risk, and it was generally accepted as the normative model of rational choice. In 1798, Daniel Bernoulli initiated the expected utility hypothesis, which postulates that rationality can be modeled as a maximization of an expected value. von Neumann and Morgenstern (1953) prove that an individual's preferences can be represented on an interval scale and the individual will always choose actions that maximize utility.

II.B. Prospect Theory and Reference Dependent Preferences

Subsequent literature on decision making in the face of risk features a departure from the standard expected utility theory, and finds that the are several forms of choice problems that display people's preferences systematically violate the axioms of expected utility theory, and argues that this theorem is not an adequate nor comprehensive descriptive model for decision making. Kahneman and Tversky (1979) present a critique of expected utility theory as a descriptive model of decision making under risk, and subsequently developed an alternative model called prospect theory. Under this model, choices among risky prospects display effects that are inconsistent with the original expected utility theory, which fails to account for some of the manipulations that alter the concept of risk aversion.[1] Kahneman and Tversky (1979) find two effects that outright contradict the basic tenets outlined by utility theory: 1) The certainty effect facilitates risk aversion in choices involving certain gains and risk seeking in choices involving certain losses; 2) The isolation effects results in inconsistent preferences when the same choice is

[1] Risk aversion is the reluctance of a person to accept a bargain with a less certain payoff rather than another bargain with a more certain, but possibly lower, expected payoff. (Arrow 1965)

presented in different ways. As such, Kahneman and Tversky (1979) develop prospect theory as alternative theory of choice wherein value is assigned to gains and losses rather than final outcomes, and wherein probabilities are replaced by decision weights. Under the framework of prospect theory, utility is defined by gains and losses relative to a neutral reference point, such as the status quo, as opposed to final assets as in expected utility theory. Further studies on the limitations of the expected utility theorem demonstrate its inadequacy in explaining risk aversion, as any concave utility function within the framework of this theorem would imply a tremendous and unrealistic degree of risk aversion over large stakes (Rabin 1997).

One of the assumptions of prospect theory is that people assess the outcomes of their decisions using both an intrinsic taste for the outcome and its deviation from a particular reference point. An individual whose behavior is subject to reference points is said to have reference dependent preferences. While recent economic research has focused on determining reference points and behavioral biases (Koszegi, Rabin 2006; Pope and Schweitzer 2011), part of the existing literature has also pushed back against the idea that these biases exist in all markets (List 2003). Koszegi and Rabin (2006) expand upon Kahneman and Tversky's (1979) prospect theory by developing a model of reference-dependent preferences. They derive "gain-loss utility" from standard "consumption utility", whereby the reference point is determined endogenously by the economic environment. They theorize that an individual's reference point primarily consists of the probabilistic beliefs she held in the recent past about outcomes. The results of their experiments indicate that in deterministic environments, an individual's preferred personal equilibrium predicts that she will maximize consumption utility, which replicates the predictions of expected utility theory as originally posited by Bernoulli in the 1700's. However, when they analyze consumer and labor-supply behavior, they find that when there is uncertainty, an individual's preferences between consumption bundles will be influenced by her environment, replicating the predictions of prospect theory.

Abeler et al. (2011) expands upon the work done with Koszegi and Rabin (2006) by critically analyzing the determinants of reference points. They analyze

Koszegi and Rabin's foundational assumption that an individual's probabilistic beliefs, or in simpler terms her expectations, are a primary determinant of her reference point. They construct an experiment wherein they manipulate a subject's rational expectations and check whether or not this manipulation influences her effort provision. Their experiment was designed such that they were able to exogenously influence a reference point in expectations, as well as precisely measure behavior as a result of that exogenous influence. They find that their models of expectation-based, reference dependent preferences successfully predicted subject behavior between treatments, in that if expectations are high, subjects work for longer relative to subjects with low expectations, corresponding with the choice-acclimating equilibrium concept in Koszegi and Rabin (2006).

II.C. Loss Aversion

The most significant manifestation of reference dependent preferences is loss aversion, as incorporated in Kahneman and Tversky's prospect theory. Because this heuristic models decision makers who react to changes in wealth (gains and losses) rather than the actual levels of wealth (outcomes), scholars have been able to utilize this model to observe that decision makers are roughly twice as sensitive to perceived losses than to gains (Rabin and Thaler 2001; Benartzi and Thaler 1995). Loss aversion can thus be defined as the tendency to feel the pain of a loss more acutely than the pleasure of a gain, given that both are equal in magnitude. Abeler et al. (2011) find evidence of individual loss aversion in their experiment on effort provision and reference points. In their experiment, their subjects displayed a preference to avoid unfavorable comparisons to what might have happened (an idea formed by their manipulated expectations), indicating evidence that reference dependence and disappointment aversion altered decision-making. Benartzi and Thaler (1995) use the concept of loss aversion to explain the equity premium

puzzle[2], which is a phenomenon that must be explained within the framework of prospect theory and loss aversion because explanations within the usual economics paradigm are inadequate. Benartzi and Thaler (1995) show that if investors evaluate the returns on their portfolio once a year, and have a piece-wise linear utility function which is twice as steep for losses as for gains (as posited by Rabin and Thaler 2001), then investors will be indifferent between stocks and bonds, negating the large difference in expected returns. They find that if investors evaluate the returns on their portfolio on a longer horizon, or if their utility function featured a less steep slope for losses, then they will demand a lower equity premium. Camerer et al. (1997) also illustrate the importance of temporal considerations, as their study on cabdrivers in New York City finds that they make labor supply decisions "one day at a time" instead of intertemporally substituting labor and leisure across multiple days.

II.D. Loss Aversion in Professional Sports

Loss aversion and reference points have important implications for competition, and subsequently professional sports. Because success in sports often involves doing better than one's opponents, the performance of said opponents becomes a salient benchmark that individuals use as a reference point to evaluate their own performance (Berger and Pope 2011). While there is extensive literature on prospect theory and the loss aversion phenomenon, the work on observing this phenomenon in professional sports is somewhat more limited. In their paper on observing loss aversion amongst professional golfers, Pope and Schweitzer (2011) examined loss aversion by considering the PGA tour, which is a series of tournaments that features professional golfers, and is thus a market that has high stakes and experienced agents. The authors found that golfers on the PGA tour exhibit loss aversion around the reference point of "par". They find that player-

[2] The equity premium puzzle is the tendency for stocks to offer higher rates of return than bonds over most intermediate-long term time intervals (Benartzi and Thaler 1995).

stroke observations better than the arbitrary reference point of par exhibit lower accuracy in putts than those in a worse position than par.

II.E. Loss Aversion in Basketball

The existing literature features very few studies that examine the in-game performances of professional basketball players in the NBA. A seminal work on this topic is Goldman and Rao's (2014) use of detailed player data to illustrate the existence of the "losing motivates" effect[3], as well as their methods involving differential exertion of effort. The authors also test if expectations influence the reference point using betting spreads and lagged score margin, and find that the reference point appears stable around zero. They also find that it is far less malleable than experimental work done in the existing literature, although that may be a spurious comparison as previous studies observe the behavior of less experienced agents. Nonetheless, their results are inconsistent with the findings of previous works on reference points and loss aversion, because they essentially argue that expectations have no effect on reference points. Goldman and Rao (2014) find strong evidence that NBA players "act in accordance with loss averse preferences around a fixed reference point for the score margin". They find that NBA players exhibit greater intensity and effectiveness the further their teams fall behind. They also find that controlling for player skill, a team that is behind by 10 points will improve by three more points per 100 possessions. Goldman and Rao (2014) find that losing teams exert more effort in the auxiliary parts of the game such as rebounds and drawing charges. Along with Deustcher et al. (2013), they do not observe a marked change in shooting accuracy, which, to a layman, the most salient factor that contributes to a team's win probability. Goldman and Rao find that losing teams tend to succeed in the effort-intensive parts of the game, but not for those that require an inherent skillset, such as shooting.

[3] The "losing motivates" effect is the phenomenon wherein an average team scores like the best team in the league when trailing by ten points, and the worst team in the league when leading by ten points. (Goldman and Rao 2014).

Berger and Pope (2011) further illustrate the effect of loss aversion on player motivation by analyzing teams' varying win probabilities based on the halftime point differential, which is a particularly effective point of analysis because it provides an ideal opportunity for players to internalize their position relative to their opponent. The authors also demonstrate the efficacy of analyzing basketball (and professional sports in general) within the context of prospect theory by considering that halftime scores are not randomly assigned, and realizing that the causal impact of a team's position relative to their opponent must be accounted for. They use a regression discontinuity (RD) design to estimate the causal impact of being slightly behind, allowing them to not only overcome the absence of randomization, but also to use the insulated nature of sports to their advantage by constructing an underlying model for how well teams are expected to do given their halftime scores relative to their opponent. This allows them to almost entirely isolate the impact of loss aversion on player effort. Their results are consistent with the theories of loss aversion, as they find that teams behind by one point actually win more often than teams ahead by one point, at a rate that is six percentage points higher than expected.

III. Critique of the Literature

The models and theories regarding loss aversion and prospect theory are particularly crystallized, so most of the limitations of the literature originate from the application of the concepts in the sports market. Analysis of loss aversion in the existing literature leans heavily towards the observation of the behavioral patterns of inexperienced agents. Critics of the belief that all agents are subject to reference dependent preferences claim that higher stakes, better competition and experience neutralize the effect of these biases. List (2003) examines individual behavior in two different markets to investigate whether market experience eliminates the endowment effect, and provides strong evidence that market experience eliminates an important market anomaly. Another argument against the use of reference dependent preferences as the primary explanation for loss averse behavior is that

reference dependence may not be the strongest force that affects an individual's decision making. Abeler et al. (2011) demonstrate this shortcoming by recognizing that the stopping behavior could be explained by the salience of the fixed payment rather than reference dependence. They consider the argument that the salience of the fixed payment influenced subjects in setting arbitrary benchmarks for earning those amounts, impacting their behavior and decision-making.

Furthermore, none of the literature found in the review features analysis involving temporal bracketing in sports, such as the studies conducted by Benartzi and Thaler (1995) and Camerer et al. (1997). The literature on loss aversion in professional basketball is sorely lacking a consideration for the potential that players compartmentalize their expectations based on time periods, such as possessions, quarters, games or even seasons.

IV. Applications and Further Testing

The models used for in-game basketball analysis are primarily centered on the score of the game and a player's success as determined by his contribution to his team's victory. In their concluding remarks, Abeler et al. (2011) posit that an interesting direction for future research is to distinguish and test between different expectation-based models of reference dependent preferences. The existing literature on loss aversion in basketball primarily assumes that an individual's reference point is determined by an inherent predilection for winning (Goldman and Rao 2014). The models used for in-game basketball analysis are centered around the score of the game and a player's success as determined by his contribution to his team's victory, so an extension of the research on this topic could feature models that illustrate alternative origins of a player's motivation to perform well. White and Sheldon (2013) discuss the distinction between extrinsic and intrinsic motivation, and point to external factors such as fan expectations, media expectations, Hall of Fame prospect and All Star Game prospects as force that unquestionably affect player performance.

A potentially interesting causal relationship, and the focus of White and Sheldon's (2013) study, is the effects of player remuneration on his performance, because they consider money to be both most prototypical extrinsic motivator and the easiest of the external factors to quantify. The efficacy of the use of the change in wages as a reward or punishment has also been demonstrated by O'Doherty et al. (2001), who utilize the process of receiving or losing money to illustrate that one emotional involvement of the human orbitofrontal cortex is its representation of the magnitudes of abstract rewards and punishments. Furthermore, Berri and Krautman (2006) demonstrate the impact of wages on player productivity by testing for shirking in the NBA. When they employ the NBA's measure of productivity, they find evidence consistent with shirking behavior. This illustrates the point that wages can be used as the representation for rewards in our analysis of behavioral patterns among players. I postulate that salary plays the same role as success in terms of winning when considering the trade-offs that players make between costly effort and rewards. However, the extent to which salary simulates winning in players' thought processes during in-game decision making is tremendously difficult to quantify. The following analysis discusses the impact that the structural aspects of remuneration and the nature of the game of basketball may have on player behavior within the framework of prospect theory and loss aversion.

IV.A. Structural Aspects of Contracts in the NBA

Remuneration in the NBA is structured such that players agree to both the length and amount of compensation received in a single-period contract negotiation following the expiration of their current contract. This means that players whose contracts are expiring following the completion of the current season will be negotiating their contracts for subsequent seasons. This situation is colloquially known as the 'contract year'. White and Sheldon (2013) observed this phenomenon by tracking 3 year periods in NBA players' careers: 1) pre-contract year (non-treated, pre-CY); 2) contract year (salient external incentive present, CY); and 3) post-contract year (salient external incentive removed, post-CY). They predicted an

increase in scoring performance during the contract year relative to the pre-contract year using extrinsic motivation theories, and confirmed their prediction by finding that there was an undermining of many player statistics in the post-CY, relative to both the CY and the pre-CY baseline. These results imply that impending contract negotiations affect players' production in that they performed at a significantly higher level on the court, thereby providing them with more leverage during contract negotiations and positively impacting their salary (White, Sheldon 2014). This is consistent with the findings of Berri and Krautman (2006), who construct a model of player productivity in order to test for player shirking immediately after signing a long-term contract. The existence of the contract year impacts our understanding of loss aversion because it alters a player's reference point. In my review of the literature, I could not find any empirical study that tests the relationship between the presence of the contract year and a player's proclivity to loss aversion, but the relationship is intuitively robust.

Furthermore, the new collective bargaining agreement (CBA) of 2011 includes various mechanisms that affect player compensation that have yet to be comprehensively discussed or analyzed by the literature but may impact the formation of a player's reference point. The introduction of the amnesty clause, which allows a team to designate one player to 'amnesty'[4], effectively gives the team the ability to erase their mistake in the event that the player does not perform well enough to justify the size of their salary. The player can be waived without his salary being counted against the salary cap, and while the team still has to pay for that player's salary, they are free to use that salary cap space on other players (Staudohar 2012). The intuitive impact of the amnesty provision is that teams are more likely to offer longer contracts to players if they believe that the penalty for losing out on the gamble of signing a player is not as severe. I postulate that the amnesty provision has an indirect impact on loss aversion in that the augmented

[4] The amnesty provision is a tool used by teams to release one player via the waiver process and remove him from their team salary and luxury tax computations. (Coon 2012)

prevalence of longer contracts results in the diminishing of the consequences of failure for players, thus altering their reference points. The way in which this contractual nuance impacts a player's reference point is somewhat unclear. One such channel of influence is that the prevalence of longer contracts alters a player's value function in that they encode losses (in this context, poorer performance) more lightly than they would if longer contracts were not as pervasive, because they would believe that there is less at stake. This could be measured by constructing an experiment that examines the difference in field goal attempts (adjusted by pace)[5] before and after the 2011 CBA. One concern for this experiment is that the number of field goal attempts could have been affected by other unobservable factors along the same time frame as the 2011 CBA. We can account for this concern by using the difference-in-differences method to determine the presence and impact of pre-existing trends in field goal attempts.

IV.B. Player Idiosyncrasies

Other external factors may contribute to the determination of a player's reference point, as I posit that player characteristics may play a role in the development of the 'kink' in his value function. One such characteristic that may affect a player's reference point is race. The intuitive effect of race discrimination on wages is that Black players earn less than White players, implying that a player's reference point is influenced by his skin color given that he is aware of the wage premium on White players. Brown et al. (1991) construct a model with explanatory variables including race, points scored per minute, rebounds per minute, average minutes per game, number of all star games, years in the NBA, and draft position to examine the effect of race on player compensation, and test for the presence of wage discrimination in professional basketball as a result of fan discrimination based on race. They found that that there is substantial wage discrimination against Black players in the NBA, as their results indicate a salary shortfall of fourteen to sixteen

[5] No study has examined the posited effect of the 2011 CBA on loss aversion. Therefore, we could use field goal attempts as an instrumental variable for a player's value function/his propensity for risk aversion.

percent with Black players as compared to the salary of White players of comparable skill. Assuming that players are fully aware of this wage discrimination, Black players may alter their reference point based on their expectations of lower wages. Furthermore, other studies on wage discrimination found that international players seem to earn less than domestic players, ceteris paribus (Yang, Lin 2012). However, Yang and Lin find that players coming from countries with larger economies seem to receive preferential treatment in contract negotiations, indicating the significance of home country markets on player salary.

Brown et al. (1991) found that the effect of wage discrimination is much less significant in situations where fans perceived team performance to be jeopardized, i.e. fans were unwilling to trade team performance for an increased proportion of White players on their favorite team. Thus, we can assume that player race and nationality are not the only extrinsic factors that influence a player's expectations of their wages. Hausman and Leonard (2006) observe the 'superstar' externality and find that it affects television ratings tremendously, which in turn gives the NBA leverage when negotiating broadcasting rights. This leads to the increase in the league wide salary cap, which remains unaccounted for in most of the existing literature.

IV.C. Structural Aspects of Games in the NBA

A player's reference point may also be influenced by in-game environmental factors. For instance, specific circumstances in a game may alter a player's expectations for his own performance. One such circumstance is 'clutch' situations, where the outcome of the game is still relatively unclear. The term 'clutch' is tantamount to a player's ability to perform under pressure situations during games[6]. Individual and team performance in this specific scenario is viewed under a

[6] The parameters of clutch situations are relatively arbitrary, but the convention amongst basketball statisticians is that clutch plays occur during the fourth quarter or overtime, when there is less than five minutes remaining in the game and neither team is ahead by more than five points. (Cao et al. 2011)

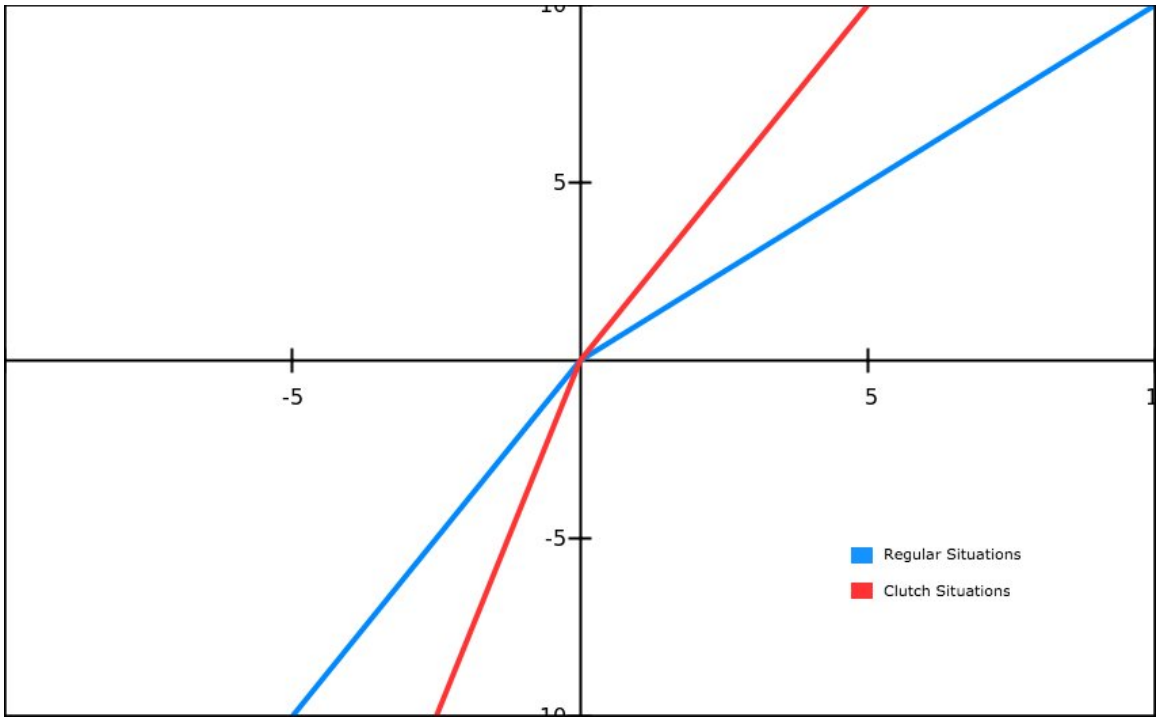
particular amount of scrutiny, and players who perform well relative to other players in this scenario are said to be 'clutch'.

Several studies have noted the importance of clutch situations on player behavior, and subsequently player remuneration. Deustcher et al. (2013) note the differences in personality traits that determine an individual's response to pressure situations, and find a statistically significant and economically considerable impact of 'mental strength' on player performance and salaries. Baumeister (1984) proposes a model for choking on coordination and skill tasks, which holds that the pressure generated by the situation enhances the salience of the performance, which disrupts the automatic or overlearned nature of the execution. The results of their experiment indicate that increased attention to one's own performance as well as situational manipulations of pressure results in performance decrements.

V. A Theoretical Framework

As previously demonstrated, there is very limited work on the impact of wage expectations on player behavior in basketball, so I aim to develop a model that incorporates player remuneration and loss aversion. Constructing an experiment that tests for the impact of clutch situations on player behavior is somewhat complicated. We need very specific play-by-play data to analyze in-game behavior, and we need detailed contract-level data to test for the influence of contractual considerations on behavioral patterns.

The figure below represents the theorized value functions for both regular and clutch situations. I assume that players display similar behavioral patterns as inexperienced agents, in that they encode losses approximately twice as heavily as they do gains. Furthermore, I assume that players encode both losses and gains twice as heavily in clutch situations as they would for regular situations.



I do not expect an empirical study on loss aversion in clutch situations to completely confirm the theory illustrated by the figure above. This theory makes two key assumptions that can be easily disproved by an empirical analysis: 1) In clutch situations, losses are encoded twice as heavily as gains, when in reality this may not be the case; 2) A player's reference point is stable around zero, when in reality it may be determined by his position relative to his opponent. In this case, it may be more appropriate to represent a player's reference point with a three dimensional figure that illustrates the diminishing nature of value encoding that depends on how far ahead or behind his team is relative to their opponents.

VI. Concluding Remarks

My analysis of loss aversion in professional basketball finds that the literature, while burgeoning, is still lacking in many respects. I find that there is still no categorical resolution on whether or not market experience and increased stakes eliminates market anomalies such as loss aversion. I also find that although professional athletes display many of the same behavioral patterns as inexperienced

agents, the structural aspects of professional sports, along with athletes' experience drastically alter our analysis of loss aversion.

References

Abeler, J., Falk, A., Goette, L., and Huffman, D. (2011). Reference points and effort provision. The American Economic Review, 101(2):470–492.

Arrow, Kenneth Joseph. *Aspects of the Theory of Risk-bearing*. Helsinki: Yrjö Jahnssonin Säätiö, 1965. Print.

Baumeister, R. (1984). Choking under pressure: Self-consciousness and paradoxical effects of incentives on skillful performance. Journal of Personality and Social Psychology, 46(3):610.

Benartzi, S., and R. H. Thaler. "Myopic Loss Aversion and the Equity Premium Puzzle."*The Quarterly Journal of Economics* (1995): 73-92. Print.

Berger, J., and D. Pope. "Can Losing Lead to Winning?" *Management Science* (2011): 817-27. Print.

Berri, David J., and Anthony C. Krautmann. "Shirking on the Court: Testing for the Incentive Effects of Guaranteed Pay." Economic Inquiry 44.3 (2006): 536-546. Print.

Brown, Eleanor, Richard Spiro, and Diane Keenan. "Wage and Nonwage Discrimination in Professional Basketball: Do Fans Affect It?." American Journal of Economics and Sociology 50.3 (1991): 333-345. Print.

Camerer, Colin F., Linda Babcock, George Loewenstein, and Richard H. Thaler. 1997. "Labor Supply of New York City Cabdrivers: One Day at a Time." Quarterly Journal of Economics, 112(2): 407–41.

Cao, Zheng, J. Price, and D. F. Stone. "Performance Under Pressure in the NBA." Journal of Sports Economics 12.3 (2011): 231-252. Print.

Coon, Larry (2012); "NBA Salary Cap/Collective Bargaining Agreement FAQ" http://www.cbafaq.com, last visited October 1, 2014

Deutscher, Christian, Bernd Frick, and Joachim Prinz. "Performance under pressure: estimating the returns to mental strength in professional basketball." European Sport Management Quarterly 13.2 (2013): 216-231. Print.

Goldman, M. and Rao, J.M. Loss Aversion Around a Fixed Reference Point in Highly Experienced Agents. (2014).

Hausman, Jerry A., and Gregory K. Leonard. "Superstars In The National Basketball Association: Economic Value And Policy." Journal of Labor Economics 15.4 (1997): 586-624. Print.

Kahneman, Daniel, and Amos Tversky. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* (1979): 263-90. Print.

Koszegi, B., and Rabin, M. (2006). A model of reference-dependent preferences. Quarterly journal of economics, 121(4).

List, John A. 2003. "Does Market Experience Eliminate Market Anomalies?" Quarterly Journal of Economics, 118(1): 41–71.

O'Doherty, J., M. L. Kringelbach, E.T. Rolls, J. Hornak, and C. Andrews. "Abstract Reward and Punishment Representations in the Human Orbitofrontal Cortex." *Nature Neuroscience* 4.1 (2001): 95-102. Print.

Pope, D. and Schweitzer, M. (2011). Is Tiger Woods loss averse? Persistent bias in the face of experience, competition, and high stakes. The American Economic Review, 101(1): 129–157

Rabin, Matthew, and Richard H Thaler. "Anomalies: Risk Aversion." *Journal of Economic Perspectives* (2001): 219-32. Print.

Rabin, Matthew. "Risk Aversion And Expected-utility Theory: A Calibration Theorem." *Econometrica* (1997): 1281-292. Print.

Staudohar, Paul. "The basketball lockout of 2011." Bureau of Labor Statistics. United States Federal Government, n.d. Web. 1 Oct. 2014. <http://www.bls.gov/opub/mlr/2012/12/art3full.pdf>.

von Neumann, John, and Oskar Morgenstern. *Theory of Games and Economic Behavior*,. [3d ed. Princeton: Princeton UP, 1953. Print.

White, Mark, and Kennon Sheldon. "The contract year syndrome in the NBA and MLB: A classic undermining pattern." Motivation and Emotion 38.2 (2013): 196-205. Print.

Yang, C.-H., and H.-Y. Lin. "Is There Salary Discrimination by Nationality in the NBA?: Foreign Talent or Foreign Market." Journal of Sports Economics 13.1 (2012): 53-75. Print.