Effects of the 2012 Collective Bargaining Agreement on the Major League Baseball Free Agent Market

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Abstract

The introduction of the 2012 Major League Baseball (MLB) Collective Bargaining Agreement (CBA) made substantial changes to the first-year player draft and the free agent market. Using a sample of 1,249 2008-2015 free agents, this study investigates the extent to which contract outcomes of top tier players have been impacted by the replacement of the Elias Sports Bureau type designations with the qualifying offer system. This study finds evidence suggesting that qualifying offer type players are now receiving worse contract outcomes relative to other free agents in each given year. Additionally, counterintuitive evidence suggests that players that would have previously been designated as top free agents are also receiving worse contract outcomes relative to other players following the new CBA. The direction of these results is not sensitive to measure of contract outcome (guaranteed amount or average annual value), however the level of statistical significance is sensitive to such measures. Future research on this subject could benefit from additional years of analysis, as well as stronger prediction models.

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1. Introduction

Labor unions face the challenge of representing a group of workers in negotiations, which involves balancing the internal demands of its members. Often, unforeseen circumstances arise that unjustly punish or reward one subset of workers while not affecting the others. The effects of these contractual contingencies often serve as the basis of negotiation in future agreements. Professional sports markets serve as an excellent ground for study of this phenomenon due to the large amount of publicly available information and statistics. This study examines potential unforeseen consequences challenging a labor union through an investigation of the Major League Baseball (MLB) 2012 Collective Bargaining Agreement (CBA).

Labor unions in Major League Baseball had very limited success until the formation of the 1968 Collective Bargaining Agreement. This was the first such agreement between players and owners in professional sports and was made possible by the successful restructuring of the Major League Baseball Players Association (MLBPA).[1] The early goals of the union were to increase the minimum salary, install an arbitration procedure, and grant players freedom from the reserve clause, thereby giving them a right to free agency. The MLBPA made steady gains until team owners forced the union into a 232 day strike in 1994-95. The union held strong against attempts to reduce their pay and benefits, and this strike established the MLBPA as one of the most powerful unions in the country. Since the 2002 collective bargaining agreement, MLB has enjoyed over a decade of prosperity without work interruptions. The players and owners renegotiated the CBA in 2007 and again in 2012.

[1] MLBPA History. (n.d.). Retrieved March 13, 2015, from http://mlb.mlb.com/pa/info/history.jsp

In recent CBA negotiations the biggest concerns have surrounded the increasing cost of player acquisition. Professional baseball teams acquire new talent primarily through three methods. The principal method is the first-year player draft. This allows teams to participate in a selection process that includes all eligible High School and College players in the United States, Canada, and Puerto Rico. The selecting team gains sole negotiating rights with the player until a set deadline. The second method of talent acquisition is the free agency market. This allows teams to sign players whose previous contract has expired. The final method of acquiring new players is the international signings market. Unlike the draft, in this market all teams have the ability to compete for top tier prospects by offering large bonuses. Success is largely determined by scouting, negotiation tactics, and ability to pay. These three methods are the lifeblood of talent acquisition in professional baseball.

Each of the three methods of talent acquisition regularly comes under scrutiny by the MLB owners due to the rising cost of signing bonuses. Over the past decade the inflation-adjusted amount paid to players has increased dramatically (an average salary increase of over 44% from 2002-2012)[2] due to a superstar effect in the demand for the highest level of talent. However, team revenues have experienced an even greater increase over the same time period. Nonetheless, owners seek to maximize their profits by keeping the cost of players as low as they can. This generally creates a tension between the players union and the owners during each round of CBA negotiations.

It is important to recognize that the MLBPA represents only players on the major league 40 man roster. Therefore, the union's main priority in

[2] MLB Salaries. (n.d.). Retrieved April 9, 2015, from http://www.cbssports.com/mlb/salaries/avgsalaries

negotiations has been keeping MLB salaries and free agency bonuses high, while paying little attention to the financial well-being of players coming from the draft or international markets. Thus, at the end of 2011, the MLBPA and owners association were able to negotiate a collective bargaining agreement that would overhaul team spending in the draft and the international markets. Structural changes linking free agency to the draft were instituted as well. The next section of this introduction details the changes to these two methods of player acquisition.

1.1. The First-Year Player Draft

As described in *Has the 2012 Major League Baseball collective bargaining agreement reduced the probability that drafted players sign a professional contract?,*[3] each summer, all 30 Major League Baseball teams seek to add talent to their organizations through the first-year player draft. Since the first draft in 1965,[4] there have been continual changes and tweaks to the structure of the draft, most recently in 2007 and 2012. Leading up to the changes in 2012, the draft consisted of 50 rounds, and teams were ordered to draft based on their finish from the previous season (with the worst team receiving the number one overall pick). The picks were not tradable, and although MLB suggested signing bonuses for each pick of each round, teams were able to spend what they wanted. This led to rapidly increasing signing bonuses each year. Wanting to combat this trend, the owners, along with the MLBPA, agreed to numerous changes in the 2012 collective bargaining agreement. The draft was reduced from 50 to 40

[3] Servais, T. (2014). Has the 2012 Major League Baseball collective bargaining agreement reduced the probability that drafted players sign a professional contract?

[4] First-Year Player Draft. (n.d.). Retrieved March 13, 2015, from http://mlb.mlb.com/mlb/history/draft/

rounds, and team bonus pools were created. Each pick in the first ten rounds now has an assigned slot value, and the sum of these values is a team's overall bonus pool. In 2014 these team bonus pools ranged from 2.2-13.3 million dollars.[5] The slot values decreased with each pick in the draft and in 2014 ranged from 7.92 million for the number 1 overall pick, to $137,600 for the picks at the end of the 10th round.[6] For every pick after the 10th round, teams can spend up to $100,000 to sign a player without it counting against their total bonus pool.

If a team chooses to spend more than its allotted bonus pool value, then it must pay a luxury tax starting with a 75% tax on the first 0-5% over the team's specified bonus pool. If a team goes 5-10% over their bonus pool, the tax will rise to 100% and it will lose its first-round draft pick in the next year. If a team goes more than 15% over, it could lose its following first-round draft picks for the next two seasons.[7] The luxury tax implies that the bonus pools are not completely binding; however, their violation triggers penalties. These rule changes, aimed at reducing the total amount spent in each year's draft, could potentially have an impact on draft strategy, and the effects have yet to be fully accounted for.

Players are eligible for the draft if they are a resident of the USA, Canada, or US territory, have graduated high school, attend a junior college, are juniors or seniors at four year colleges, or have turned 21.[8] Drafted players and teams

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[5] Cooper, J. (2014, April 2). 2014 Draft: Signing Bonus Allotments By Team. Retrieved March 13, 2015, from http://www.baseballamerica.com/draft/2014-draft-signing-bonus-allotments-by-team/

[6] 2014 Draft: Assigned Pick Values For Top 10 Rounds - BaseballAmerica.com. (2014, April 2). Retrieved March 13, 2015, from http://www.baseballamerica.com/draft/2014-draft-assigned-pick-values-for-top-10-rounds/

[7] MLB players, owners sign agreement. (2011, November 23). Retrieved March 13, 2015, from http://espn.go.com/mlb/story/_/id/7269300/major-league-baseball-players-owners-sign-new-labor-agreement

[8] First-Year Player Draft FAQ. (n.d.). Retrieved March 13, 2015, from http://mlb.mlb.com/mlb/draftday/faq.jsp

have until July 12th-18th to reach a contract agreement.[9] If no deal is reached, then the player is able to go or return to college. If the pick was in the top 3 rounds and the team offered the player at least 40% of the slot value, then the team receives a compensation pick of similar value in the next year's draft.[10] This gives teams more leverage in negotiating with top prospects. Additionally, before the 2012 CBA teams could offer select players major league contracts as part of the negotiation. However, under the new rules all players are limited to signing minor league deals. In the past, the lack of signing bonus structure had led to a negotiation-friendly environment; however, with a stronger emphasis placed on sticking to slot values there is now less flexibility.[11]

The changes to the draft have placed a cap on the total amount that teams can spend on signing draftees. This cap is directly related to the ordered draft picks the team is assigned. If the team is forced to give up a top draft pick (as is the case when signing certain free agents) then they are also giving up the right to use that amount of money signing any players. For example, a team may have a total bonus pool of over $14 million, yet if they are forced to give up a first round draft pick that pool shrinks to under $13 million.[12] I hypothesize that the value of this first round draft pick could be calculated into team decisions to sign free agent players. Thus an understanding of the interaction between the draft and the free agent market is crucial in this study.

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[9] Before the 2012 CBA the deadline was August 15th

[10] Before the 2012 CBA teams received a compensation pick only for unsigned selections in the first round

[11] Servais, T. (2014). Has the 2012 Major League Baseball collective bargaining agreement reduced the probability that drafted players sign a professional contract?

[12] 2014 Draft: Assigned Pick Values For Top 10 Rounds - BaseballAmerica.com. (2014, April 2). Retrieved March 27, 2015, from http://www.baseballamerica.com/draft/2014-draft-assigned-pick-values-for-top-10-rounds/

1.2. The Free Agency Market

Players work their entire careers dreaming of when they will finally reach free agency. A player must play 6 full seasons in the major leagues before their original contract expires and free agency is an option. The right to negotiate and sign with other teams was one of the first priorities of the MLBPA when it was established. Free agency frees players from the constraints of negotiating with only one team and allows their compensation to be determined by the competitive market. Free agents often receive multi-year contracts with lucrative signing bonuses, salaries, and potential performance bonuses. The MLBPA only represents players on the major league 40 man roster and is thus invested in developing a player-friendly free agency process that results in large contracts.

Before the 2012 collective bargaining agreement, the free agency process generally followed a certain sequence. First, free agents would be categorized as Type A, Type B, or no compensation free agents by the Elias Sports Bureau.[13] The rankings were largely based on a player's statistical performance relative to other players in the league at the given position. Type A's were in the top quintile at their position, while Type B's were in the second quintile. Each year there were generally 20-25 Type A free agents, 35-40 Type B's, and 100-105 no compensation free agents.[14] Teams could then choose to offer arbitration to the player at the end of the season. If the player declined arbitration, the team losing the player would receive compensatory draft picks. For a Type A free agent, the losing team would get the first round pick of the signing team in the next year's

[13] Elias Sports Bureau is an independent sports statistics agency http://www.esb.com/about/

[14] Note that the number of Type A and Type B free agents does not match up. This is most likely because the Elias designations use a ranking of all players regardless of contract status. It is likely that the best players in the league are engaged in multi-year contracts and therefore reach free agency less often than the average player.

draft in addition to a "sandwich" pick between the first and second rounds.[15] For a Type B free agent the signing team would not have to forfeit a pick, and the team losing the free agent would only get one compensatory "sandwich" pick. The top 15 picks of the draft were, however, protected from forfeiture.[16] Instead teams with these picks were forced to surrender their second pick in the draft to the team losing the free agent.

The 2012 CBA brought many structural changes to the free agency market. The new CBA does away with the type designation of players. Instead, teams can now choose to offer the player a one-year-long "qualifying" offer. The qualifying offer is a value set by the league that is equal to the average salary of the top 125 MLB players. The offers for 2013, 2014, and 2015 were $13.3 million, $14.1 million, and $15.3 million, respectively. In three off-seasons only 34 players have received a qualifying offer. If the player declines the offer, the team losing the free agent is eligible to draft pick compensation only if the player was on their team for the entire season and the player signs with another team before the next draft. If this occurs, then the player's original team gets a draft pick from the new team. Under the previous CBA, there was an incentive to trade for top free agents near the end of the season so that the team receiving the player would be eligible for draft-pick compensation following the loss of the player in the upcoming off season. Because draft-pick compensation reduces a player's off-season value, the MLBPA fought to have this incentive structure changed. Under the new CBA, teams no longer have misplaced incentive in trading for top free

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[15] Leach, M. (2013, February 12). As expected, new rules impact free-agent market. Retrieved March 13, 2015, from http://m.mlb.com/news/article/41560238/as-expected-new-mlb-free-agent-compensation-rules-impact-free-agent-market

[16] This is done in order to protect the most vulnerable teams from losing out at an elite talent acquisition opportunity.

agents during the season because draft pick compensation is only applicable for players that remained on the same team for the entire season. Additionally, only the top 10 picks in the draft are protected from forfeiture under the new agreement.

The surprising part about the new system is that out of the 34 players offered a qualifying offer, none have accepted it.[17] The most likely reason is that the offer is only good for one season, and most players who receive a qualifying offer feel they could get multi-year deals in the open market. The MLBPA represents major league players and had their interests in mind when negotiating the CBA; it is strange that they would devise a system that fails to improve the bargaining position of free agents. But the new system appears to have hurt some of the players that rejected the offer: several players that rejected the offer went unsigned the entire offseason, in part because signing them would have required giving up a draft pick.[18] According to free agent Stephen Drew, "you fight for the right to get to free agency, but then it takes a little bit away with draft-pick compensation attached to it. Nobody wants to give up that draft pick…It's unusual because I'm an experienced player, but because there's a draft pick hanging over your head, it's not really the free agency without strings attached."[19] Some players were left without a contract until after the draft the following June. While the players could have lowered their demand, the new

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[17] Gleeman, A. (2014, November 10). For the third straight offseason every free agent declined the qualifying offer. Retrieved March 13, 2015, from http://hardballtalk.nbcsports.com/2014/11/10/for-the-third-straight-offseason-every-free-agent-declined-the-qualifying-offer/

[18] Cantania, J. (2014, November 15). How to Fix Qualifying Offer Dilemma in MLB. Retrieved March 13, 2015, from http://bleacherreport.com/articles/2267419-changes-mlb-can-make-to-fix-the-qualifying-offer-dilemma-in-free-agency

[19] Cafardo, N. (2014, March 13). Stephen Drew stuck in free agent purgatory. Retrieved March 28, 2015, from http://www.bostonglobe.com/sports/2014/03/13/stephen-drew-would-love-back-with-red-sox-but/dIu0ywjBIIkRZJJcZsJMJL/story.html

CBA still punishes the signing team with the forfeiture of a top draft pick. Under the previous system, teams were much more willing to give up their draft picks than they are now.

The imposition of draft bonus pools has made each top pick that much more valuable. This is because a team's bonus pool is the summed slot value of each of their draft picks. If a team loses their first round pick, not only are they giving up the right to draft a quality player, they also lose the millions of dollars worth of slot value in their bonus pool that could have been spent on other players in the draft. This study will investigate the extent to which select free agents have been affected by this unforeseen consequence. I expect that qualifying offer type players are worse off due to the increased value placed on draft pick forfeiture. However, I also hypothesize that players that would have previously received a Type A designation are now better off financially (assuming they don't receive a qualifying offer). This is because they no longer have draft pick forfeiture tied to their signing. This study investigates the effects of the 2012 CBA on the MLB free agent market with respect to qualifying offer and Type A players.

2. Literature Review

Collective bargaining agreements make for interesting economic study due to the establishment of a formal cutoff point in analysis (before and after their implementation). Their formation allows researchers to analyze the direct effects of new policy and rule implementation, as this study intends to do. CBA's are difficult to negotiate by nature of the competing interests of the many parties involved. In his discussion of the 2002 MLB CBA, Zimbalist finds that the negotiation process of CBA's in baseball is hampered by disunity among the owners.[1] They struggle to agree on a common vision for the game, which often leads to long delays before collective bargaining is even initiated. Additionally, when the owners do agree to come to the bargaining table, it is usually based on their only area of agreement: they would like to pay the players less. This leads the owners to begin negotiations with demands of sacrifice of the players, thus setting an adversarial tone for negotiations from the very beginning. Finally, due to the disunity among the owners, the MLBPA must bargain with the different groups of interests separately. They must simultaneously balance the wishes of both the large and small market teams in negotiation. Zimbalist finds that each of these difficulties encourages unexpected bargaining outcomes. This is why an analysis comparing the actual outcomes to the CBA's intentions is relevant in illuminating bargaining inefficiencies. It is likely that bargaining agreements formed under challenging conditions will have unintended consequences, often impacting those most unsuspecting.

[1] Zimbalist, A. (2003). Labor Relations In Major League Baseball. *Journal of Sports Economics, 4*(4), 332-355.

2.1. The First-Year Player Draft

The MLB First-Year Player Draft is often used in the study of bargaining due to its insulated structure. Garmon studied the draft because "there are no bonus restrictions, draft picks cannot be traded, and there are no commitment issues (i.e., players 'declaring' for the draft)."[2] He examined the effect of the rule changes stemming from the 2007 CBA using data from 2003-2010. Garmon found that although the rule changes were designed to lower signing bonuses, they had the opposite effect. The 2007 CBA improved compensation to teams if they fail to sign a draft pick, reduced MLB's bonus recommendations, and shortened the signing period. Garmon claims that as a result of these changes $178 million in additional signing bonus was spent on drafted players. The 2012 CBA turns the bonus recommendations into a formal slot system (as described in the First-Year Player Draft section of the introduction) and shortens the signing period to an even greater extent. This study investigates the potential unintended consequences in the free agency market stemming from the changes to the draft in the 2012 collective bargaining agreement.

Studies focusing on the draft often also compare the value of high school vs. college players, and expected earnings or expected major league production. In one such study, Winfree and Molitor observe the predicted career earnings of high school and college draftees.[3] They find that if drafted in the top rounds of the draft (around top 20% of picks), it is in a player's best interest financially to forgo college and pursue a professional career. They further show, using 2003 draft data, that players largely followed this guideline when making their signing

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[2] Garmon, C. (2013). Major League Baseball's First Year Player Draft: A Natural Laboratory for the Study of Bargaining. *Journal of Sports Economics*, 14(5), 451-478.

[3] Winfree, J., & Molitor, C. (2007). The Value of College: Drafted High School Baseball Players. *Journal of Sports Economics, 8*(4), 378-393.

decisions. This indicates that players make signing decisions largely based on monetary factors. Thus one would expect to see a change in behavior resulting from signing bonus limits, as is the case under the new agreement. This is why the slot value tied to picks is important to teams when considering signing a free agent at the expense of giving up a draft pick (as is described in the free agency section of the introduction).

2.2. The Free Agency Market

The MLB free agency market is also frequently used in studies of bargaining and economic preferences. Link and Yosifov examined two periods of free agency, 1984-94 and 2003-06, to determine if players sacrifice additional monetary gains in favor of the security offered by long-term contracts.[4] Their empirical results indicate that position players do make the tradeoff between salary and job security. The results are not sensitive to the definition of salary used, but could be altered by the chosen player productivity measure. These results are significant in my analysis because I intend to use two different measures of contract value (guaranteed contract value and average annual value) in order to account for job security preferences among players. This study will also incorporate multiple measures of player productivity (wins above replacement and other generic statistics) in order to better support a conclusion. Understanding the inherent preferences of players is important in supporting a conclusion involving their relative well-being following changes to the collective bargaining agreement.

[4] Link, C., & Yosifov, M. (2012). Contract Length and Salaries Compensating Wage Differentials in Major League Baseball. *Journal of Sports Economics*, 13(1), 3-19.

In addition to player strategy, team preferences and behavior play a role in shaping the free agency market each year. Krautmann examined a player's contract terms relative to their consistency of performance on the field.[5] Using a sample of free agent position players from 2008-11 he found that risk-averse owners are willing to pay a contract premium for consistent performance. Additionally, as variability in performance increases, the terms of the player's contract decrease in value (with respect to salary). In order to account for the preference for consistency, my analysis will take into account a player's performance in the previous year, and also their performance an additional year prior. Including multiple years of performance will help account for this team preference, which can have substantial impacts on free agency decision-making.

Ultimately the MLB free agency market can be analyzed using supply and demand analysis. Rockerbie investigated whether a greater supply of free-agent players at a particular position has any effect on contract salaries.[6] He then developed a model of salaries that suggests that a greater supply of free-agent position players should lower the final contract values of the signees. Using a sample of free agents from 1997-2002 Rockerbie confirmed the free-agent supply effect for catchers and shortstops, but not for other fielding positions. This is likely due to the additional value placed on defense at these positions while players at other positions could be more easily substituted for and replaced. Controlling for the makeup of each individual market among the different positions is important in forming a conclusion about the impacts of the 2012 collective bargaining agreement.

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[5] Krautmann, A. (2014). Risk-Averse Team Owners and Players' Salaries in Major League Baseball. *Journal of Sports Economics,* forthcoming.

[6] Rockerbie, D. (2009). Strategic Free Agency in Baseball. *Journal of Sports Economics*, 10(3), 278-291.

3. Data

The dataset necessary to study the market for MLB free agents has two crucial components. The first is player contract information. This includes the player's previous salary, the new contract signing bonus, years of the new contract, and total guaranteed value of the new contract. This data is not easily publicly available and was made accessible for this study through the internal database of the Los Angeles Angels of Anaheim. The second necessary component for a study of free agency is player performance statistics. This is widely available through many online sources. This study uses the data provided by FanGraphs.com[1] for the 2006-2014 seasons. Matching the two datasets together allows for analysis of contract outcomes given past player performance and characteristics.

This dataset includes most but not all players that have reached free agency since the implementation of the 2007 collective bargaining agreement. In order to be included in the sample players needed to become free agents during the 2007-08 offseason or later. This is because the changes to the CBA in 2007 did not impact the free agent market until players were being signed for the 2008 season. Additionally, they must have appeared in a major league game in the year prior to their free agency. This ensures the existence of the player's most recent performance statistics. Note that players may have both pitching and hitting statistics if they have participated at both positions during the course of a season. These specifications yield a dataset of 1,249 free agent players from 2008-2015.

[1] Baseball Statistics and Analysis | FanGraphs Baseball. (n.d.). Retrieved March 13, 2015, from http://www.fangraphs.com/

3.1. Generic and Contract Variables

Table 1. Generic and Contract Variable Summary Statistics

VARIABLES	N	mean	sd	min	max
Year	1249	2011	2.224	2008	2015
Age	1249	33.97	3.458	26	46
TypeA	1249	0.0921	0.289	0	1
TypeB	1249	0.153	0.360	0	1
QualifyingOffer	1249	0.0272	0.163	0	1
AllStar	1249	0.381	0.486	0	1
PrevSalary	1249	$4,233,000	$4,283,000	$380,000	$28,000,000
SalaryYr1	1249	$2,756,000	$3,860,000	$0	$27,000,000
GrtdYears	1249	1.135	1.209	0	10
GrtdAmount	1249	$7,937,000	$22,790,000	$0	$275,000,000
AAV	1249	$3,227,000	$4,475,000	$0	$27,500,000
PotPerfBonus	1249	$564,257	$1,105,000	$0	$14,550,000

Year is the variable associated with the year of the upcoming season. If *Year* equals 2009, then the free agency contract was signed in the period between the 2008 and 2009 seasons. Therefore, the important cutoff in this study is between 2012 and 2013 because this is when the new rule changes stemming from the 2012 CBA first took effect.

Age is the variable representing the player's age at the time of signing a new contract. The youngest player in this sample is 26 years old because players are unable to achieve free agency until they have played 6 seasons in the major leagues.

TypeA, TypeB, & QualifyingOffer are type-of-player designations explicitly outlined by the 2007 and 2012 collective bargaining agreements. *TypeA* is a binary variable indicating if the player was designated as a Type A free agent by the Elias Sports Bureau. These are players rated in the top quintile at their

position. *TypeB* is a binary variable indicating if the player was designated as a Type B free agent by the bureau. These players are rated in the second quintile of performance at their position. Type A and B designations only exist for players reaching free agency before the 2012-13 offseason. *QualifyingOffer* is a binary variable that indicates if the player received a qualifying offer from their team. This designation only exists beginning in the 2012-13 offseason. The qualifying offer is an announced value each year that equals the average salary of the top 125 MLB players in the upcoming season. The offers for 2013, 2014, and 2015 were $13.3 million, $14.1 million, and $15.3 million, respectively. The offer is only for a one-year contract and expires one week after the team makes the offer.[2] In this sample of players there are 115 Type A's, 188 Type B's, and 34 players that received a qualifying offer.

AllStar is a binary variable indicating whether a player has been selected as an All-Star at any point in his career. This data was retrieved from ESPN's online reference list.[3] This metric could help quantify a player's popularity with fans. It is possible that more popular players have more bargaining power when they reach the free agency market.

PrevSalary is the variable indicating the player's annual salary in the year preceding his free agency. This is relevant in future bargaining because it may indicate a player's historical value in the market. The lower bound on this variable is equal to the major league minimum salary.

SalaryYr1, GrtdYears, GrtsAmount, AAV, & PotPerfBonus are all variables relating to the player's new contract. *SalaryYr1* is the player's base salary in the

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[2] Explaining MLB's 'qualifying offer' (2012, November 2). Retrieved March 13, 2015, from http://www.csnne.com/article/explaining-mlbs-qualifying-offer

[3] MLB All-Star Game. (n.d.). Retrieved March 18, 2015, from http://espn.go.com/mlb/allstargame/history/results

first year of the new contract. *GrtdYears* is a discrete variable for the number of years guaranteed on the contract. Players generally prefer long term, stable, contracts. *GrtdAmount* is the variable for the total guaranteed monetary value of the contract. If a player signs a 10 year deal for $10 million per year, then the guaranteed amount is $100 million. However, player salaries generally increase over the duration of a contract. Therefore, I also include *AAV,* the average annual value of the contract. If a player signs a $50-million contract for four years, then the average annual value is $12.5 million. Finally, *PotPerfBonus* is the potential performance bonus a player could receive (as specified in the contract). MLB allows bonuses based on availability measures of performance (at-bats, innings pitched, etc.) but bans the use of power measures (home runs, wins, etc.).[4] Players have freedom to negotiate for more guaranteed money versus the potential for higher bonuses.

[4] Krautmann, A. (2014). Risk-Averse Team Owners and Players' Salaries in Major League Baseball. *Journal of Sports Economics,* 1-15.

3.2. Player Performance Variables

3.2.1. Offensive Metrics

Table 2. Offensive Player Performance Summary Statistics

VARIABLES	N	mean	sd	min	max
PA	979	236.9	216.3	0	739
PA2	956	266.7	226.2	0	734
HR	979	5.955	8.199	0	54
HR2	956	6.884	8.661	0	43
RBI	979	26.15	28.45	0	156
RBI2	956	30.01	29.85	0	129
AVG	979	0.203	0.117	0	1
AVG2	956	0.211	0.127	0	1
BBK	979	0.374	0.328	0	2.44
BBK2	956	0.4	0.331	0	2.25
OBP	979	0.26	0.139	0	1
OBP2	956	0.272	0.148	0	1
OPS	979	0.562	0.298	0	2
OPS2	956	0.588	0.316	0	3

PA, & PA2 are the variables for the number of plate appearances a player had in the season before free agency and two season prior, respectively. Regardless of outcome, this is the number of times a player approached the plate to hit during the season. Therefore, this is a good metric of player availability. If a player is injured for a large part of the season then he will be able to contribute fewer plate appearances. Teams will likely place value on players that are able to perform more often than others, especially if they are able to do this in more than one year.

HR, & HR2 are the variables for the number of home runs hit by a player in the previous season, and the season before that. Home runs are a standard

metric of offensive performance. As a power measure they are crucial in calculating a player's contribution to runs scored. Home runs also carry an additional entertainment factor that may incentivize owners to pay more for players capable of hitting them. This assumes that owners are interested in viewership as well as in team wins. Nonetheless, home runs are one of the most longstanding statistics in baseball.

RBI, & RBI2 are the variables for the number of runs batted in by a player in the previous season, and the season prior to that. An *RBI* is the "number of times a run scores as a result of a batter's plate appearance, not counting situations in which an error caused the run to score or the batter hit into a double play."[5] If a batter performs well when other players are in scoring position (occupying 2nd or 3rd base), then it is likely they will have a high *RBI* total.

AVG, & AVG2 are the variables for the batting average of the player in the previous season, and the season before that. Batting average is calculated as the number of hits a player gets divided by the number of at-bats they have. If a player's batting average is .300, they can be expected to get a hit 3 times out of 10 at-bats.

BBK, & BBK2 are the variables for an offensive player's ratio of walks to strikeouts in the previous season, and the season before that. It is calculated as the number of walks over the number of strikeouts in a season. It is commonly used as a measure of plate discipline among batters.

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[5] Complete List (Offense) | FanGraphs Sabermetrics Library. (n.d.). Retrieved March 13, 2015, from http://www.fangraphs.com/library/offense/offensive-statistics-list/

OBP, & OBP2 are the variables for a player's on-base percentage in the previous season, and the season before that. On base percentage is the rate at which a batter safely reaches base.[6] *OBP* is calculated as follows:

OBP = (Hits + Walks + Hit by Pitches) / (At-bats + Walks + Hit by Pitches + Sacrifice Flies)

While *RBI's* indicate a player's ability to drive runs in, on base percentage is a commonly used metric indicating a player's ability to score runs themselves.

OPS, & OPS2 are the variables for a player's on-base percentage (OBP) plus their slugging percentage (*SLG*). *SLG* is the average number of total bases per at-bat, calculated as total bases divided by number of at-bats. *OPS* is simply the sum of *OBP* and *SLG*. There are two primary ways to contribute to run scoring in baseball. You can either be on base and score the run, or drive the run in and earn an *RBI*. *OPS* has commonly been used as an offensive metric that includes both a player's ability to get on base and their potential to drive in runs.

[6] Complete List (Offense) | FanGraphs Sabermetrics Library. (n.d.).

3.2.2. Defensive Metrics

Table 3. Defensive Player Performance Summary Statistics

VARIABLES	N	mean	sd	min	max
Putouts	1235	136.7	232.6	0	1394
Putouts2	1176	157.8	248	0	1458
Assists	1235	45.13	82.98	0	475
Assists2	1176	53.79	94.29	0	486
Errors	1235	2.639	3.62	0	25
Errors2	1176	3.007	4.027	0	25
TotalChances	1235	184.4	265	0	1498
TotalChances2	1176	214.6	282.5	0	1619
FieldingPercentage	1235	0.957	0.126	0	1
FieldingPercentage2	1176	0.964	0.105	0	1

Putouts, & Putouts2 are the variables crediting a defensive player for getting a batter or runner out in the previous season, and season before that. Putouts can be recorded by catching a fly ball, tagging a base a runner is trying to advance to, or tagging a runner off a base.[7] Additionally, catchers can earn putouts for strikeouts. Typically first basemen record very high putout numbers.

Assists, & Assists2 are the variables crediting a defensive player for contributing to getting a batter or runner out in the previous season, and the season before that. Typically this occurs when a fielder throws the ball to another fielder who gets credit for the putout.[8] Usually infielders record very high numbers of assists.

Errors, & Errors2 are the variables recording the number of errors a defensive player made in the previous season, and the season before that. An

[7] Putouts and Assists. (2012, September 9). Retrieved March 13, 2015, from https://baseballscoring.wordpress.com/site-index/putouts-and-assists/

[8] Putouts and Assists. (2012, September 9).

error is charged to the defensive player if the batter gets on base instead of being putout, if a runner advances extra bases due to a mistake by the fielder, or the at-bat is prolonged due to a missed out opportunity.[9] In some circumstances a fielder can get an error even if they don't touch the ball. Errors are determined each game by an official scorer.

TotalChances, & TotalChances2 are the variables for a fielder's total chances over the previous season, and the season before that. A player's total chances are the sum of his *Putouts, Assists, & Errors.*[10] Total chances serves as an availability metric demonstrating a player's time spent in the field.

FieldingPercentage, & FieldingPercentage2 are the variables indicating a player's fielding percentage over the previous season, and the season before that. Fielding percentage is calculated as the total number of *Putouts* plus *Assists* divided by the number of total chances.[11] A player hurts his fielding percentage when he commits an error. Fielding percentage is a good metric for indicating the consistency of play by a defensive player. However, it is an imperfect overall measure of defensive ability because it fails to account for the difficulty of certain plays. Fielding percentage only accounts for situations when the player handles the ball, leaving out situations when the player could have handled the ball but failed to do so.

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[9] Errors. (2012, September 6). Retrieved March 13, 2015, from https://baseballscoring.wordpress.com/site-index/errors/

[10] Total chances - BR Bullpen | Baseball-Reference.com. (n.d.). Retrieved March 13, 2015, from http://www.baseball-reference.com/bullpen/Total_chances

[11] Fielding Percentage - FPCT Definition - Sporting Charts. (n.d.). Retrieved March 13, 2015, from http://www.sportingcharts.com/dictionary/mlb/fielding-percentage-fpct.aspx

3.2.3. Pitching Metrics

Table 4. Pitching Player Performance Summary Statistics

VARIABLES	N	mean	sd	min	max
IP	603	81.74	60.01	0.1	253
IP2	547	91.45	62.11	0.1	241
Games	603	38.69	21.74	1	92
Games2	547	41.04	21.36	1	88
GamesStarted	603	9.177	12.38	0	35
GamesStarted2	547	10.54	13.16	0	35
GamesInRelief	603	29.52	28.59	0	92
GamesInRelief2	547	30.5	29.79	0	88
TotalGamesSP	603	23.94	10.43	0.5	46
TotalGamesSP2	547	25.79	9.639	0.5	44
TotalGamesRP	603	47.87	20.86	1	92
TotalGamesRP2	547	51.58	19.28	1	88
Wins	603	4.562	4.084	0	20
Wins2	547	5.296	4.432	0	21
Losses	603	4.833	4.061	0	18
Losses2	547	5.43	4.213	0	18
WLPercentage	603	0.49	0.227	0	1
WLPercentage2	547	0.488	0.204	0	1
Saves	603	3.126	8.757	0	62
Saves2	547	4.104	10.09	0	50
WSaves	603	7.688	9.191	0	64
WSaves2	547	9.4	10.19	0	53
IPHits	603	1.028	0.248	0.05	2.1
IPHits2	547	1.034	0.235	0.05	2.245
ERA	603	4.388	5.689	0	135
ERA2	547	4.271	1.754	0	22.5
Strikeouts	603	62.3	46.31	0	252
Strikeouts2	547	69.29	46.37	0	240
KBB	603	2.366	1.393	0	14.33
KBB2	547	2.417	1.188	0	11.22

IP, & IP2 are the variables for the total number of innings pitched by a player in the previous season, and the season before that. Analogous to plate appearances (*PA),* innings pitched is used as a measure of player availability. Starting pitchers generally throw more innings than relief pitchers over the course of an entire season.

Games, Games2, GamesStarted, GamesStarted2, GamesInRelief, & GamesInRelief2 are all variables indicating the number of games a pitcher appeared in during the previous season, and the season before that. *GamesStarted* is the number of games started by a pitcher while *GamesInRelief* counts the number of times a pitcher appeared in relief of the starting pitcher. *Games* is the sum of *GamesStarted* and *GamesInRelief.*

TotalGamesSP, TotalGamesSP2, TotalGamesRP, & TotalGamesRP2 are all variables indicating the number of games a pitcher appeared in during the previous season, and the season before that. This variable is split differently between starting pitchers and relief pitchers because Elias Sports Bureau defines them differently given the player's listed position. The variables are calculated as follows:

*TotalGamesSP = GamesStarted + .5*GamesInRelief*

*TotalGamesRP = 2*GamesStarted + GamesInRelief*

Wins, & Wins2 are the variables for the total number of wins a pitcher has during the previous season, and the one before that. A starting pitcher earns a win if he pitches at least 5 innings, his team takes the lead while he is in the game, the team never gives up the lead, and the team wins the game.[12] A relief

[12] Winning and Losing Pitcher. (2012, September 9). Retrieved March 13, 2015, from https://baseballscoring.wordpress.com/site-index/winning-pitcher/

pitcher earns a win if he is pitching when his team takes the lead, and that lead is never lost. Wins are generally a poor and unfair metric of pitching performance because they depend on the offensive ability of the pitcher's team. Nonetheless, they could make for compelling eye candy in the free agency market.

Losses, & Losses2 are the variables for the total number of losses a pitcher has during the previous season, and the one before that. A pitcher records a loss if they give up the run that gives the other team the lead, which they never relinquish. Again, losses are often an unfair metric of performance as they rely on the offensive ability of the pitcher's team.

WLPercentage, & WLPercentage2 are the variables for win-loss percentage in the previous season, and the season before that. The percentage is calculated as the number of *Wins* divided by the number of *Wins* and *Losses*.

Saves, & Saves2 are the variables for the number of saves a pitcher records during the previous season, and the season before that. A save is recorded when a pitcher finishes the game (won by his team), he is not the winning pitcher, he enters the game with a lead of three runs or less and pitches for at lease one inning.[13] Saves are an important pitching metric, so much so that teams often have specified "closers" whose primary responsibility is to record saves.

WSaves, & WSaves2 are the variables for the number of *Wins* plus the number of *Saves* by a pitcher in the previous season, and the season before that. It is only an important metric because it is used by the Elias Sports Bureau in their ranking of free agent players.

IPHits, & IPHits2 are the variables for the innings pitched per hit by a pitcher in the previous season, and the season before that. This is calculated by

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[13] Save - BR Bullpen | Baseball-Reference.com. (n.d.). Retrieved March 13, 2015, from http://www.baseball-reference.com/bullpen/Save

taking the number of innings pitched divided by the number of hits allowed by a pitcher. This metric is also only important because it is used by the Elias Sports Bureau in their ranking of free agents.

ERA, & ERA2 are the variables for a pitcher's earned run average during the previous season, and the season prior to that. It is calculated as the average number of earned runs a pitcher allows per 9 innings pitched.[14] Earned runs are determined by an official scorer. *ERA* is a very popular metric for pitching performance, but does not control for many external factors (e.g., defense, ballpark, league, etc.).

Strikeouts, & Strikeouts2 are the variables for the number of strikeouts a pitcher records during the previous season, and the season before that. This metric is important because it is used in the Elias Sports Bureau ranking of starting pitchers.

KBB, & KBB2 are the variables for a pitcher's strike to walkout ratio in the previous season, and the season before that. It is simply the number of strikeouts divided by the number of walks. It is generally used as a good measure of pitcher control and accuracy.

[14] Complete List (Pitching) | FanGraphs Sabermetrics Library. (n.d.). Retrieved March 15, 2015, from http://www.fangraphs.com/library/pitching/complete-list-pitching/

3.2.4. Total Player Contribution

Table 5. Wins Above Replacement Summary Statistics

VARIABLES	N	mean	sd	min	max
WAR	1249	0.767	1.4	-2.2	9.6
WAR2	1182	0.933	1.381	-2.2	7.7

WAR, & WAR2 are the variables for wins above replacement in the previous season, and the one before that. *WAR* is the primary performance metric of this study. *WAR* is an attempt to summarize a player's total contribution to their team in one statistic.[15] It attempts to show the number of additional wins a player contributed to their team over the course of a season in comparison to a standard triple-A replacement player. *WAR* is calculated differently between position players and pitchers. For position players:

WAR = (Batting Runs + Base Running Runs + Fielding Runs + Positional Adjustment + League Adjustment +Replacement Runs) / (Runs Per Win)[16]

WAR gives no additional weight to clutch performance (player performance in close games and blowouts is counted equally). *WAR* for pitchers is a slightly more complex calculation that greatly relies on the use of fielding independent pitching (*FIP).*[17] While many may argue that *WAR* places unfair weight on certain metrics (e.g., defense), it currently serves as the most comprehensive available metric for quantifying a player's contribution.

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[15] What is WAR? | FanGraphs Sabermetrics Library. (n.d.). Retrieved March 13, 2015, from http://www.fangraphs.com/library/misc/war/

[16] A detailed breakdown of each component is available at http://www.fangraphs.com/library/war/war-position-players/

[17] WAR for Pitchers | FanGraphs Sabermetrics Library. (n.d.). Retrieved March 13, 2015, from http://www.fangraphs.com/library/war/calculating-war-pitchers/

4. Qualifying Offers

Since the introduction of the 2012 Collective Bargaining Agreement thirty-four free agents have been offered a qualifying offer and each one has turned it down. This section of the study aims to understand how the contract outcomes of qualifying offer type players have been affected by the introduction of a new CBA.

4.1. Analysis of Qualifying Differences

4.1.1. Calculation of Qualifying Difference

In order to determine the relative well-being of the top tier free agents, it is first relevant to compare their new contracts with the qualifying offer that they each rejected. In order to do this, new information must be added to the dataset. *QualifyingValue* is the variable for the value of the offer rejected by the player. This value changes with each year because it is an average of the top 125 MLB contract salaries. Therefore, in 2013, 2014, & 2015 *QualifyingValue* equals $13.3, $14.1, & $15.3 million, respectively. Next, variables named *QualifyingDifference* and *lnQualifyingDifference* must be created where:

$$QualifyingDifference = QualifyingValue - SalaryYr1$$

$$lnQualifyingDifference = lnQualifyingValue - lnSalaryYr1$$

These represent the difference between the rejected guaranteed salary offered by a team through the *QualifyingValue,* and the value of their salary in the first year of their new contract (*SalaryYr1).* The natural log terms are included to account for possible outliers among the free agents. This study will use t-tests on the sample of players offered a qualifying offer to determine if the change in salary is significantly different from zero. The result of the tests will suggest whether

players on average are making the best financial decision by rejecting the qualifying offer. One would expect that players have their own financial best interest in mind and would think carefully before rejecting the guaranteed offer in favor of the open market. Given that these players made a choice to enter the open market, I expect to find that they receive greater compensation in the first year of their new contract.

In addition to comparing the rejected qualifying offer with the player's salary in the first year of their contract, I also compare the rejected offer with the average annual value (*AAV*) of the new contract. Therefore:

$$QualifyingDifferenceAAV = QualifyingValue - AAV$$

$$lnQualifyingDifferenceAAV = lnQualifyingValue - lnAAV$$

As shown by Link and Yosifov,[1] players have a preference for secure long-term contracts. Therefore, it is likely that players reject the qualifying offer in favor of the probability of a multi-year contract in the open market. In Major League Baseball most free agent contracts are backloaded in monetary payout. Even if the salary in the first year of their contract is lower than the rejected qualifying offer, examining the average annual value will account for backloading. T-tests will determine if *QualifyingDifferenceAAV* and *lnQualifyingDifferenceAAV* are statistically different from zero, and will indicate if players offered the qualifying offer instead have a preference for secure and backloaded contracts.

[1] Link, C., & Yosifov, M. (2012). Contract Length and Salaries Compensating Wage Differentials in Major League Baseball. *Journal of Sports Economics*, 13(1), 3-19.

4.1.2. Results of Qualifying Difference

Table 6. T-Test of Contract Outcomes of Players that Rejected the Qualifying Offer

Variable	Obs	Mean	Std. Err.	Std. Dev.	T-Value	P-Value
QualifyingDifference	34	$1,020,226	663986.1	3871671	1.5365	0.1339
lnQualifyingDifference	34	0.1106344	0.0502655	0.2930955	2.201	0.0348
QualifyingDifferenceAAV	34	-$1,259,103	731772.9	4266933	-1.7206	0.0947
lnQualifyingDifferenceAAV	34	-0.0507167	0.044747	0.2609174	-1.1334	0.2652

In the sample of the 34 free agents that rejected the qualifying offer, the *QualifyingDifference* and *lnQualifyingDifference* appear to be positive. This indicates that on average players are getting a smaller salary in the first year of their contract than they would have gotten had they accepted the qualifying offer. In an open market context one would expect this value to be negative. Although enlightening, this two-sided test demonstrates that the difference is not statistically significant at a 90% confidence level (as is demonstrated by the p-value of .1339). However, the result when using the natural log is significant at a 95% confidence level (p-value of .0348). This sample provides some indication that players are sacrificing short term salary by rejecting the qualifying offer.

In the same sample of free agents, *QualifyingDifferenceAAV* and *lnQualifyingDifferenceAAV* appear to be negative. This indicates that on average players are getting a larger average annual value than the value of the qualifying offer that they rejected. This is consistent with the expectation that players sacrifice short term monetary gains in favor of backloaded long-term contracts available in the open market. This two-sided test is significant at the 90% confidence level (as is demonstrated by the P-Value of .0947). On the whole, players may be making the best long-term financial decision in rejecting the qualifying offers.

4.2. Analysis of Qualifying Offer Type Players

In order to determine the relative financial well-being of qualifying offer type players this study will first estimate a model of the probability of receiving a qualifying offer using the 2013-2015 sample. The estimates will then be used to predict which 2008-2012 free agents would have received a qualifying offer had they been free agents under the new CBA. Then I will model contract outcomes (average annual value and guaranteed amount) using the 2008-2012 sample of free agents who would have received qualifying offers. Finally I will use the new estimates to predict the contract outcomes of the 2013-2015 free agents who received a qualifying offer.

4.2.1. Modeling the Probability of a Qualifying Offer

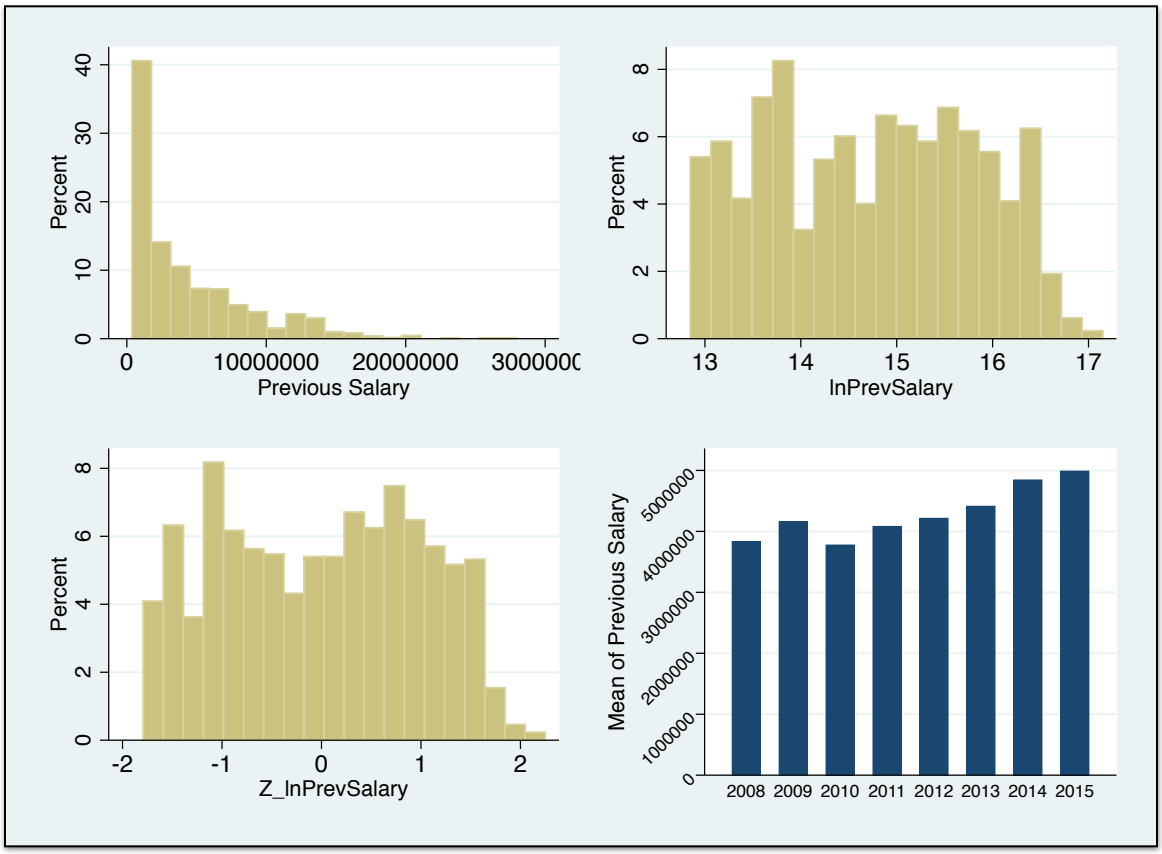
The next section of this study will create a model using the sample of 415 free agents following the introduction of the new collective bargaining agreement. The model will estimate which free agents prior to the new CBA would have been offered a qualifying offer had the new rules been in effect at the time. Models 1 and 2 will be run as follows using the sample of free agents from 2013-2015:

$$P_i = \beta_0 + \beta_1 Z\_lnPrevSalary_i + \beta_2 WAR_i + \beta_3 WAR2_i + \beta_4 AllStar_i + \beta_5 Age_i + u_i \quad (1)$$

Model 1 is a probit where P_i is the probability of *QualifyingOffer,* which is a binary variable for whether or not the player received a qualifying offer from their existing team. For completeness, Model 1 is first estimated by probit, and then by ordinary least squares (OLS).

In modeling a player's probability of receiving a qualifying offer, it is important to include some measure of the salary the player earned in the season prior to reaching free agency. Previous salary likely represents (or is a proxy for) the natural talent level that helps a player contribute to a team, and we can expect to find a positive relationship between previous salary and the probability of receiving a qualifying offer.

Figure 1. Previous Salaries of 2008-2015 MLB Free Agents



In this study, previous salary is specified as *Z_lnPrevSalary* — the Z-score of the natural log of the player's salary in the previous year. The rationale for using this specification is that the distribution of *PrevSalary* is heavily skewed to the right, as can be seen in the first panel of Figure 1. Taking the natural log of *PrevSalary* eliminates this skewness, and calculating the Z-score normalizes the measure, as can also be seen in Figure 1.

WAR, & WAR2 are included in the model because they are the best available metrics for a player's on-the-field contribution in their past season, and season before that, respectively. This study expects that the coefficients on *WAR & WAR2* will both be positive and statistically significant. This is because a player's productivity over the past two seasons should relate to the player's potential output in the future. Additionally, this study expects to find that the effect *WAR* is of greater magnitude than the effect of *WAR2* in determining probability of receiving a qualifying offer. This is because teams likely place more value on the most recent performance of the player.

Finally, the variable for whether or not the player has ever been an All-Star is included in the model to help account for the player's popularity in the game. It is likely that more popular players are more highly sought after in the free agency market, and could influence a team's decision to extend a qualifying offer to player. This study expects to find a positive relationship between being an All-Star and receiving a qualifying offer.

Again, the parameters of the above model are estimated using the sample of 415 free agents from 2013-2015. The model will then be used to obtain a prediction of the probability that a free agent from 2008-2012 would have received a qualifying offer if the new CBA had been in place during that time — the characteristics of the 2008-2012 free agents are substituted into the estimated equation and solved to obtain a predicted probability. This study will use a cutoff probability of .5 to decide which players under the old collective bargaining agreement would have most likely received the offer had the qualifying offer existed. Using this subsample of 2008-2012 free agents, I will then predict the contract outcomes for these free agents (those from 2008-2012 who are predicted to have received a qualifying offer) using a model described in the next section.

4.2.2. Estimates of the Model

Table 7. Probability of Receiving a Qualifying Offer for 2013-2015 MLB Free Agents

EQUATION	Probit(1)	Margins(1)	OLS(1)
VARIABLES	Pr(QualifyingOffer)	Pr(QualifyingOffer)	Pr(QualifyingOffer)
Z_lnPrevSalary	0.706***	0.0138*	0.0239**
	(0.263)	(0.00724)	(0.0111)
WAR	0.471***	0.00922	0.0812***
	(0.0858)	(0.00641)	(0.0132)
WAR2	0.0309	0.000605	0.0133
	(0.0813)	(0.00166)	(0.0130)
AllStar	0.388	0.00759	0.0515*
	(0.273)	(0.00747)	(0.0284)
Age	-0.0750*	-0.00147	-0.00547*
	(0.0417)	(0.00113)	(0.00329)
Constant	-0.506		0.168
	(1.345)		(0.109)
Observations	415	415	415
R-squared			0.306

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 7 shows estimates of the model in section 4.2.1. for the probability of a player receiving a qualifying offer under the new CBA. As anticipated, the coefficient in Probit Model 1 associated with *Z_lnPrevSalary* is positive and statistically significant at a 99% confidence level. This indicates that previous salary serves as a valuable determinant of whether a player will receive a qualifying offer in the upcoming offseason. Additionally, *WAR* is positive as expected and is of greater magnitude than *WAR2.* It is surprising that the coefficient for *WAR2* is not statistically significant. One possible explanation for this is that teams place much more value on the most recent performance while ignoring performance in past seasons. However, this is contradictory to the

evidence presented by Krautmann,[2] who found that teams have a preference for consistency of performance among players in the free agent market. Another explanation is that WAR2 could be positively correlated with WAR, thus making its effects in the regression indiscernible. However a test between the two variables only shows a correlation of .4654.

As hypothesized, *AllStar* is positively related with the probability of receiving a qualifying offer. However, the relationship is not statistically significant at a 90% confidence level. Finally, *Age* provides some evidence that as a player ages they are less likely to receive a qualifying offer.

The probit model will be used in favor of the linear probability model due to the likely shape of the distribution. On average fewer than 12 players receive a qualifying offer out of a group of 150 free agents each year. A probit model is generally used when modeling a binary dependent variable. Using this probit model a prediction is estimated for the remaining 2008-2012 free agents. This predicted value gives the probability that they would have received a qualifying offer had the rules been in effect under the previous collective bargaining agreement. This prediction categorizes 64 2008-2012 free agents (using a cutoff of P_i>.5) as qualifying offer type players for the purposes of this study.

4.2.3. Contract Outcomes of Qualifying Offer Type Players

The financial well-being of top tier free agents is likely determined by a combination of factors such as player characteristics, performance, and yearly fluctuation in market supply and demand for talent. In evaluating the well-being of qualifying offer type players this study aims to isolate the effects of the new

[2] Krautmann, A. (2014). Risk-Averse Team Owners and Players' Salaries in Major League Baseball. *Journal of Sports Economics,* forthcoming.

CBA from general market and player characteristic effects. To do this the study first calculates the probability that a given player would have received a qualifying offer in section 4.2.2. In this section contract outcome equations will be determined using the sample of 2008-2012 predicted qualifying offer players. In order to determine the effects of the new collective bargaining agreement, this study will compare the actual contract terms of 2013-2015 qualifying offer players with their predicted contract terms had the previous CBA remained in effect. The predicted contract terms will be determined using the sample of 34 2013-2015 qualifying offer player characteristics in the 2008-2012 contract outcome formulas.

Contract terms will be compared using average annual value and guaranteed amount. As illustrated in Figure 2, the distribution of these two variables is skewed heavily to the right. Therefore, the natural log of each is calculated. Note that using natural logs removes observations with an *AAV* or *GrtdAmount* of zero. In this dataset that corresponds to the removal of 277 players for *AAV* and 309 players for *GrtdAmount* (there is overlap among these players). This loss of observations is not crucial to this section of the study because I am investigating the financial impact on only the qualifying offer type players. The players dropped from the dataset are generally players that are retiring from the game or have been invited to try out for the team in spring training as a non-roster invite.[3] The qualifying offer type players are unaffected because they are generally some of the best free agent players in the league. All 34 of them have successfully signed non-zero contracts with teams.

[3] Strickland, L. (2015, February 18). Every MLB Team's Non-Roster Invitee with Best Shot to Make Roster. Retrieved March 20, 2015, from http://bleacherreport.com/articles/2365759-every-mlb-teams-non-roster-invitee-with-best-shot-to-make-roster

Figure 2. 2008-2015 Free Agent Contract Average Annual Value and Guaranteed Amount

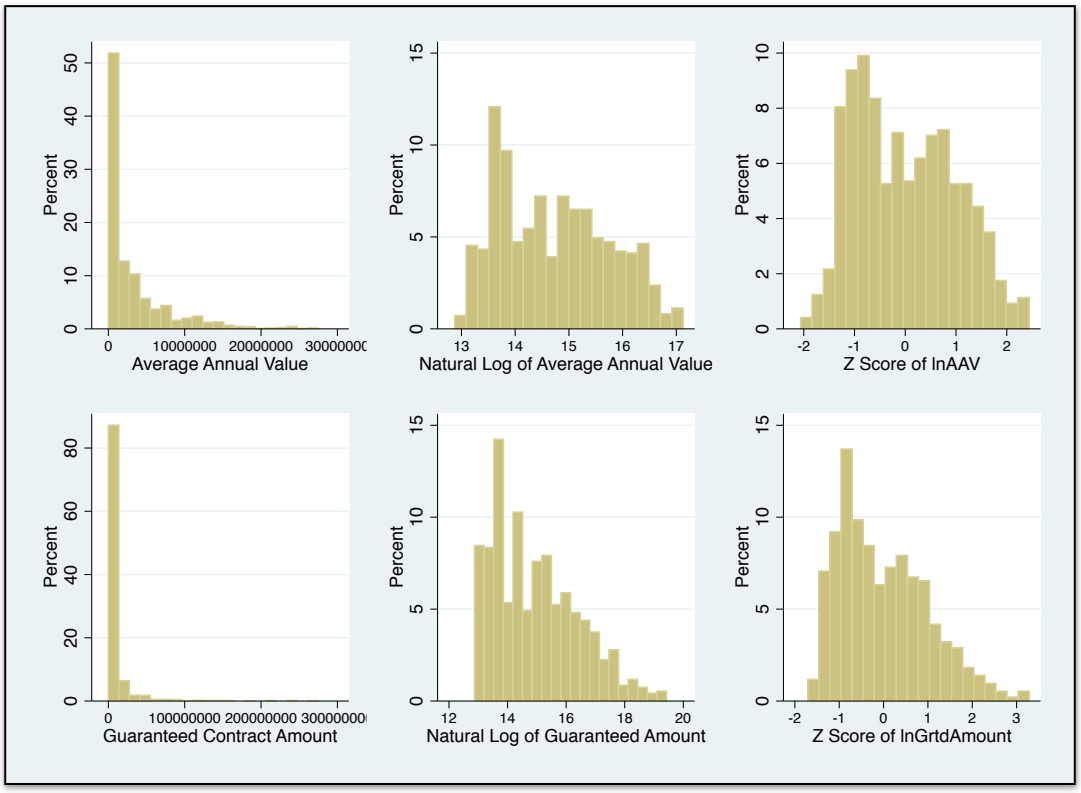


Figure 3. Free Agent Average Annual Value and Guaranteed Amount by Year

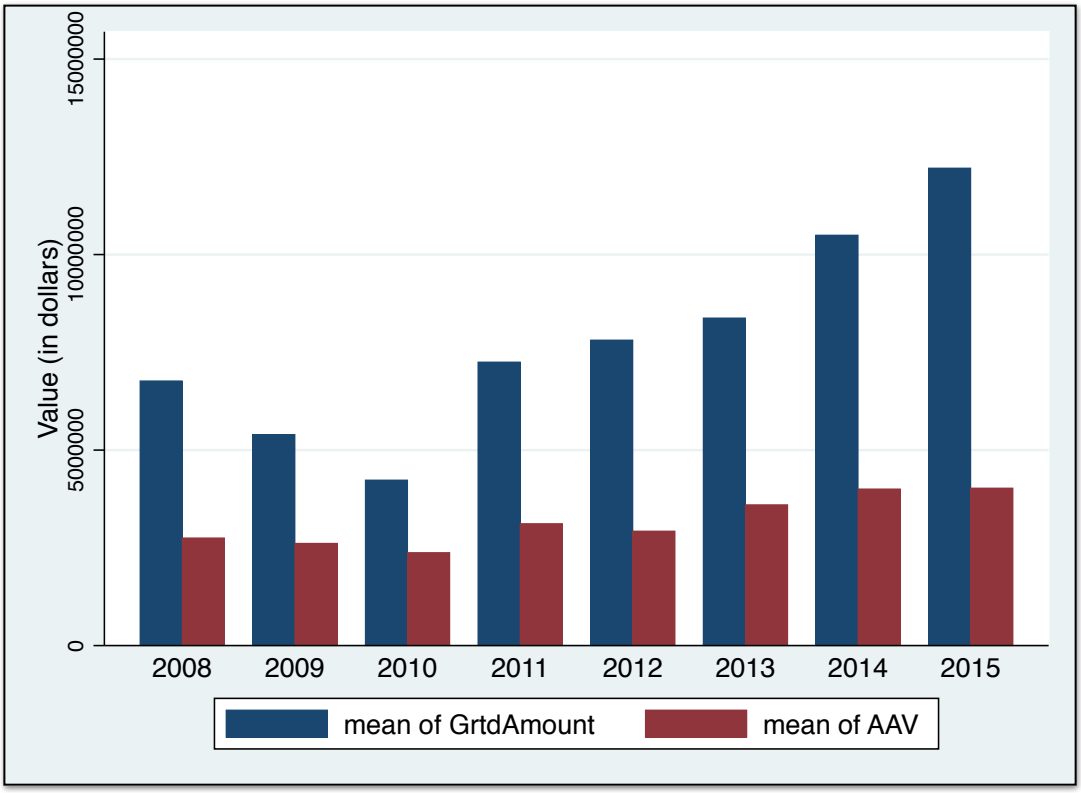


Figure 3 shows the trend of guaranteed amount and average annual value of free agents in the constructed dataset. In order to account for natural yearly market fluctuations this study will use normalized *AAV* and guaranteed amount. A normalized Z-score will be calculated for each entry relative to the other contracts signed in the given offseason. This will allow conclusions to be made about the contract outcomes of subsets of players (those offered a qualifying offer) relative to the market as a whole that given offseason. The normalized distributions for the natural log of guaranteed amount and average annual value are also depicted in Figure 2.

This section of the study will use the model from section 4.2.2. to determine the relative financial well-being of players that received the qualifying offer. First, regressions will be run predicting *Z_lnAAV* and *Z_lnGrtdAmount* for free agent players from 2008-2012. However, the regressions will only be run using players that received a predicted probability of receiving a qualifying offer of greater than .5 from the prediction in section 4.2.2.

$$Z\_lnAAV_i = \beta_0 + \beta_1 Z\_lnPrevSalary_i + \beta_2 WAR_i + \beta_3 NoWAR2_i + \beta_4 AllStar_i + \beta_5 Age_i + u_i \quad (2)$$

$$Z\_lnGrtdAmount_i = \beta_0 + \beta_1 Z\_lnPrevSalary_i + \beta_2 WAR_i + \beta_3 NoWAR2_i + \beta_4 AllStar_i + \beta_5 Age_i + u_i \quad (3)$$

In regression 2 the dependent variable is *Z_lnAAV* while in regression 3 *Z_lnGrtdAmount* is the estimated variable. I expect *Z_lnPrevSalary* to be positively related to *Z_lnAAV* & *Z_lnGrtdAmount. WAR* is included to account for the player's most recent performance. I expect the coefficient on this variable to be positive. *NoWAR2* is a dummy variable to account for if the player has a valid *WAR2* entry in the dataset. This indicates if the player was active at all during the season two years before their free agency. *NoWAR2* equals one if the

player failed to appear in a game during the given season. A negative coefficient value would indicate that teams value a player's ability to play each season (free from injury or suspension), regardless of actual output. *AllStar* is included to account for the player's popularity and is also expected to be positively related to the dependent variables. Finally, Age is included in the regression because it is likely that players reach their maximum earnings potential during the prime of their career and then taper off as they age. Using the output from regressions 3 and 4 a prediction of *Z_lnAAV* and *Z_lnGrtdAmount* is calculated for players that received a qualifying offer in the 2013-2015 time period. This estimates what each of the qualifying offer players would average using their own characteristics, but the contract equation of the previous CBA.

The final step in this process is to compute a t-test for the difference between the actual contract outcomes of players that received a qualifying offer with their predicted contract outcomes (according to models 2 and 3). This study expects to find that the actual contract outcomes are inferior to the predicted outcomes due to the increased penalties borne by a team in signing a player that has rejected a qualifying offer. Because of the changes to the collective bargaining agreement, top draft picks are more valuable to teams now than ever before. Therefore, it is likely they will be more hesitant in forfeiting their first pick in order to sign a free agent that has rejected a qualifying offer. I expect this to result in worse contract outcomes for the players that rejected the qualifying offer.

4.2.4. Estimates and Comparison of Actual Qualifying Offers with Counterfactuals

Table 8 shows estimates of equations 2 and 3 for *Z_lnAAV* and *Z_lnGrtdAmount*. The models are estimated using the sample of free agents from 2008-2012 who, according to the model shown in Table 7, would have received a qualifying offer if they had been free agents under the new CBA.

Table 8. Average Annual Value and Guaranteed Amount for 2008-12 MLB Free Agents

EQUATION	(2)	(3)
VARIABLES	Z_lnAAV	Z_lnGrtdAmount
Z_lnPrevSalary	0.299***	0.264**
	(0.104)	(0.121)
WAR	0.173***	0.248***
	(0.0449)	(0.0464)
NoWAR2	-0.741**	-0.633*
	(0.313)	(0.343)
AllStar	0.289	0.233
	(0.247)	(0.271)
Age	-0.00426	-0.0259
	(0.0293)	(0.0356)
Constant	0.556	1.209
	(1.039)	(1.222)
Observations	64	64
R-squared	0.853	0.817

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

As predicted, the coefficient on the normalized natural log of previous salary is positive and statistically significant. *WAR* is also positive, significant, and indicates the value teams place on performance in the player's most recent season. Neither *Age* or *AllStar* are significant in this sample of free agents.

Finally, *NoWAR2* is negative and statistically significant indicating that teams do value a player's past ability to perform, regardless of quality of performance. The coefficients in the above regressions are used to predict contract outcomes for the 34 qualifying offer players in the 2013-2015 free agent sample (had the old CBA remained in effect).

Table 9. T-Test on Players who Rejected the Qualifying Offer using Predicted Contract Outcomes

Variable	Obs	Mean	Std. Err.	Std. Dev.	T-Value	P-Value
Z_lnAAV	34	1.423347	0.0556301	0.3243764	-1.5607	0.1234
Z_lnAAV_Predicted	34	1.545467	0.0550241	0.3208427		
Z_lnGrtdAmount	34	1.45162	0.0976085	0.5691503	-1.9086	0.0607
Z_lnGrtdAmount_Predicted	34	1.680272	0.0694566	0.4049983		

Table 9 shows the results of the two-sample t-test between the actual average annual value contract outcomes of players that received a qualifying offer and their predicted contract outcomes. Recall that the mean of these samples represents the normalized (by year) natural logarithm of the player's average annual value in their new contract. According to these calculations, if the 34 qualifying offer players were valued using their characteristics with the formula constructed from observations under the previous CBA (Models 2 and 3), the actual contract outcomes are less than the predicted amounts. However, this difference has a p-value of only .1234, so the evidence is weak that the average annual values of the contracts have suffered since the introduction of the new collective bargaining agreement.

Table 9 also shows the results of the t-test between the actual guaranteed amount that qualifying offer players received and the predicted guaranteed amount. As hypothesized, the actual contract outcome is less than the predicted amount. Here the evidence is more persuasive due to a p-value of only .0607.

This indicates that players that received a qualifying offer would have been financially better off (with respect to guaranteed contract amount) had the old collective bargaining agreement still been in place.

4.3. Discussion

The 2012 collective bargaining agreement introduced a new system for handling the transition of top free agents from one team to another. Instead of a formal designation system, the qualifying offer was devised as a way of giving more decision making power to the teams. Teams can now choose which free agents are worth draft pick compensation by weighing the value of a forgone top draft pick with the cost of the one year offer. I hypothesized that the changes to the MLB draft would have effects on free agent compensation due to this new system. Previously teams forfeited draft picks when signing Type A free agents. Now they must forfeit when signing a player that has rejected a qualifying offer. Changes to the draft now make top draft picks more valuable to teams due to the introduction of a slotting system. Therefore, I expected that contract outcomes of qualifying offer type players (as predicted in Probit Model 1) would be worse than they would otherwise have been, relative to other players in the given year following the changes to the CBA. The t-test in table 9 provides partial evidence that this hypothesis was correct. In terms of both average annual value and guaranteed amount qualifying offer type players are doing worse off than what would have been expected under the old agreement, although the evidence is stronger for the guaranteed amount than the AAV.

Although little literature exists on the implementation of collective bargaining agreements in sports, this study contributes a focused approach examining potential unforeseen outcomes. It is unlikely the MLBPA foresaw the

potential consequences to free agency in altering the structure of the draft. However, several high profile cases have demonstrated the issue. Designated Hitter Kendrys Morales rejected a qualifying offer from the Seattle Mariners of $14.1 million following the 2013 season. No teams pursued Morales in the offseason, likely due to the draft pick forfeiture required.[4] Morales didn't play for the first half of the season, but signed on the first day following the draft with the Minnesota Twins for $7.5 million for the remainder of the season, much less than the original qualifying offer. The worse outcomes can be partially accounted for by the owners' aversion to forfeiting top draft picks. This section of the study provides empirical evidence suggesting that these qualifying offer type players are receiving worse contract outcomes as a result of the new draft and free agency rules in the CBA.

This section of the study is not without shortcomings. One major factor in the conclusion is the validity of the prediction originating from Probit Model 1. This model is an attempt to predict which players would expect to receive a qualifying offer. However, the model only correctly predicts 10 of 34 qualifying offer players. One explanation for the model's shortcomings is that teams can only extend qualifying offers to players that were with the team for the full season. Even if a player performed well during a given year they may be ineligible to receive a qualifying offer due to a mid-season trade. This poses complications in the model because some players' statistics warrant receiving a qualifying offer, yet due to regulation they were ineligible. The constructed dataset fails to account for this condition. Therefore, in future research I suggest constructing a similar model that is run using only players eligible to receive a qualifying offer. This

[4] Wilmoth, C. (2014, June 8). Twins Sign Kendrys Morales. Retrieved March 26, 2015, from http://www.mlbtraderumors.com/2014/06/kendrys-morales-twins-agree-to-terms.html

would reduce the number of observations from 415, but the sample may produce more robust results further proving the difference in contract outcomes as a result of the new CBA.

5. Elias Sports Bureau Type A Designations

Elias Sports Bureau player rankings were first introduced to MLB in 1981. Over time they underwent continuous changes until their final edition, introduced in 2006. This version stood in place until the 2012 MLB collective bargaining agreement eliminated the need for the bureau's rankings in favor of the qualifying offer system. Removing what had been a staple of the MLB free agency process is bound to have repercussions. This section of the study uses what is known about the bureau's formula for 2008-2012 to identify players who would have been designated as Type A following the introduction of the qualifying offer system in the 2012 offseason. Once this group of players is established I will attempt to draw conclusions about their relative compensation as a result of the changes in the CBA. I expect that the removal of draft pick forfeiture for signing Type A tier players has improved the negotiating power, and contract terms, of this group of players (assuming no qualifying offers).

5.1. *Methodology*

5.1.1. *Modeling Type A Free Agents*

The most recent version of the Elias rankings split players up into five positional groups for comparison, so I will estimate five different regressions, one for each positional group. Under the bureau's rankings different groups are rated using different sets of statistics. Additionally, players are compared relative to their positional group in determining the ranking. Once each regression is run using only those players before the new CBA at the given position, a prediction for the probability of being a Type A player will be made for the 2013-2015 free agents in the dataset. The prediction will correspond with the probability they

would have been designated as a Type A free agent, at the given position, under the former system. Finally, the five predictions will be aggregated into one by using whichever prediction corresponds to a player's listed position.

Starting pitchers are the first positional group that this study examines. There are 183 starting pitchers in this complete dataset. According to the Elias Sports Bureau, starting pitchers are compared using the following statistics from their past two seasons: total games, innings pitched (*IP*), wins, win-loss percentage, earned run average (*ERA*), & strikeouts.[1] Therefore, model 4 will be estimated on the sample of starting pitcher free agents prior to the 2012 collective bargaining agreement:

$$P_i = \beta_0 + \beta_1 TotalGamesSP_i + \beta_2 TotalGamesSP^2{}_i + \beta_3 TotalGamesSP2_i + \beta_4 TotalGamesSP2^2{}_i + \beta_5 IP_i + \beta_6 IP^2{}_i + \beta_7 IP2_i + \beta_8 IP2^2{}_i + \beta_9 Wins_i + \beta_{10} Wins^2{}_i + \beta_{11} Wins2_i + \beta_{12} IPWins2^2{}_i + \beta_{13} WLPercentage_i + \beta_{14} WLPercentage2_i + \beta_{15} ERA_i + \beta_{16} ERA2_i + \beta_{17} Strikeouts_i + \beta_{18} Strikeouts^2{}_i + \beta_{19} Strikeouts2_i + \beta_{20} Strikeouts2^2{}_i + u_i \quad (4)$$

P_i is the probability a given starting pitcher is designated as a Type A free agent by the Elias Sports Bureau. Each player's statistics from the previous season are included in the regression as well as their statistics from the season the year before that. Both years are included in the prediction regression because Elias has said that it uses two years of data to make its rankings. Squared terms are included for some variables in the model because the Elias statistical rankings give weight only to a player's statistical rank over another player. In other words, players receive the same ranking credit for earning one more win as they do for earning 5 more wins than the next closest player. It is likely that each additional

[1] Isaacs, N. (2011, November 15). If Elias Used WAR | FanGraphs Baseball. Retrieved March 18, 2015, from http://www.fangraphs.com/blogs/if-elias-used-war/

win at small numbers has a greater impact on their ranking (and thereby their probability of being designated a Type A player) than does an additional win when they already lead the league.[2] After this model is estimated, a prediction will be calculated for each 2013-2015 free agent in the dataset. The predicted value will equal the probability they would have received a Type A designation as a starting pitcher regardless of their actual position (which is included in the dataset).

The next positional group to be examined is the relief pitchers. There are 357 relief pitchers in this complete dataset. According to the Elias Sports Bureau, relief pitchers are compared using the following statistics from their past two seasons: total games, innings pitched (*IP*), wins + saves, innings pitched per hit ratio, strikeout to walk ratio, & earned run average (*ERA*).[3] Therefore, model 5 will be estimated as follows on the sample of free agent relief pitchers prior to the 2012 collective bargaining agreement:

$$P_i = \beta_0 + \beta_1 TotalGamesRP_i + \beta_2 TotalGamesRP^2{}_i + \beta_3 TotalGamesRP2_i + \beta_4 TotalGamesRP2^2{}_i + \beta_5 IP_i + \beta_6 IP^2{}_i + \beta_7 IP2_i + \beta_8 IP2^2{}_i + \beta_9 WSaves_i + \beta_{10} WSaves^2{}_i + \beta_{11} WSaves2_i + \beta_{12} WSaves2^2{}_i + \beta_{13} IPHits_i + \beta_{14} IPHits2_i + \beta_{15} KBB_i + \beta_{16} KBB2_i + \beta_{17} ERA_i + \beta_{18} ERA2_i + u_i \quad (5)$$

P_i is the probability a given relief pitcher is designated as a Type A free agent by the Elias Sports Bureau. Again, statistics are included for two years of performance and some terms are squared. After this model is run, a prediction will be calculated for each 2013-2015 free agent in the dataset. The predicted value will equal the probability they would have received a Type A designation as a relief pitcher regardless of their actual position.

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[2] This is because the distribution of Wins league wide is graphically skewed to the right

[3] Isaacs, N. (2011, November 15). If Elias Used WAR | FanGraphs Baseball.

The third positional group to be examined is the first basemen, outfielders, and designated hitters. There are 336 players of this group in the complete dataset. It makes sense to group these positions together because they are offense oriented positions. According to the Elias Sports Bureau, this group of players is compared using the following statistics from their past two seasons: plate appearances (*PA*), batting average (*AVG*), on base percentage (*OBP*), home runs (*HR*), & runs batted in (*RBI*).[4] Therefore, model 6 will be estimated as follows on the sample of free agent first basemen, outfielders, and designated hitters prior to the 2012 collective bargaining agreement:

$$P_i = \beta_0 + \beta_1 PA_i + \beta_2 PA^2_i + \beta_3 PA2_i + \beta_4 PA2^2_i + \beta_5 AVG_i + \beta_6 AVG2_i + \beta_7 OBP_i + \beta_8 OBP2_i + \beta_9 HR_i + \beta_{10} HR^2_i + \beta_{11} HR2_i + \beta_{12} HR2^2_i + \beta_{13} RBI_i + \beta_{14} RBI^2_i + \beta_{15} RBI2_i + \beta_{16} RBI2^2_i + u_i \quad (6)$$

P_i is the probability a given first basemen, outfielder, or designated hitter is designated as a Type A free agent by the Elias Sports Bureau. Again, statistics are included for two years of performance and the relevant terms are squared. After this model is run, a prediction will be calculated for each 2013-2015 free agent in the dataset. The predicted value will equal the probability they would have received a Type A designation as a first basemen, outfielder, or designated hitter regardless of their actual position.

The fourth positional group to be examined is the second basemen, third basemen, and shortstops. There are 192 players of this group in this complete dataset. According to the Elias Sports Bureau, this group of players is compared using the following statistics from their past two seasons: plate appearances (*PA*), batting average (*AVG*), on base percentage (*OBP*), home runs (*HR*), runs

[4] Isaacs, N. (2011, November 15). If Elias Used WAR | FanGraphs Baseball.

batted in (*RBI*), fielding percentage, & total chances.[5] Therefore, model 7 will be estimated as follows on the sample of free agent second basemen, third basemen, and shortstops prior to the 2012 collective bargaining agreement:

$$P_i = \beta_0 + \beta_1 PA_i + \beta_2 PA^2_i + \beta_3 PA2_i + \beta_4 PA2^2_i + \beta_5 AVG_i + \beta_6 AVG2_i + \beta_7 OBP_i + \beta_8 OBP2_i + \beta_9 HR_i + \beta_{10} HR^2_i + \beta_{11} HR2_i + \beta_{12} HR2^2_i + \beta_{13} RBI_i + \beta_{14} RBI^2_i + \beta_{15} RBI2_i + \beta_{16} RBI2^2_i + \beta_{17} FieldingPercentage_i + \beta_{18} FieldingPercentage2_i + \beta_{19} TotalChances_i + \beta_{20} TotalChances^2_i + \beta_{21} TotalChances2_i + \beta_{22} TotalChances2^2_i + u_i \quad (7)$$

P_i is the probability a given second basemen, third basemen, or shortstop is designated as a Type A free agent by the Elias Sports Bureau. Again, statistics are included for two years of performance and the relevant terms are squared. After this model is run, a prediction will be calculated for each 2013-2015 free agent in the dataset. The predicted value will equal the probability they would have received a Type A designation as a second basemen, third basemen, or shortstop regardless of their actual position.

The final positional group to be examined is the catchers. There are 114 catchers in this complete dataset. According to the Elias Sports Bureau, catchers are compared using the following statistics from their past two seasons: plate appearances (*PA*), batting average (*AVG*), on base percentage (*OBP*), home runs (*HR*), runs batted in (*RBI*), fielding percentage, & assists.[6] Therefore, model 8 will be estimated as follows on the sample of free agent catchers prior to the 2012 collective bargaining agreement:

$$P_i = \beta_0 + \beta_1 PA_i + \beta_2 PA^2_i + \beta_3 PA2_i + \beta_4 PA2^2_i + \beta_5 AVG_i + \beta_6 AVG2_i + \beta_7 OBP_i + \beta_8 OBP2_i + \beta_9 HR_i + \beta_{10} HR^2_i + \beta_{11} HR2_i + \beta_{12} HR2^2_i +$$

[5] Isaacs, N. (2011, November 15). If Elias Used WAR | FanGraphs Baseball.

[6] Isaacs, N. (2011, November 15). If Elias Used WAR | FanGraphs Baseball.

$$\beta_{13}RBI_i + \beta_{14}RBI^2{}_i + \beta_{15}RBI2_i + \beta_{16}RBI2^2{}_i + \beta_{17}FieldingPercentage_i + \beta_{18}FieldingPercentage2_i + \beta_{19}Assists_i + \beta_{20}Assists^2{}_i + \beta_{21}Assists2_i + \beta_{22}Assists2^2{}_i + u_i \quad (8)$$

P_i is the probability a given catcher is designated as a Type A free agent by the Elias Sports Bureau. Again, statistics are included for two years of performance and the relevant terms are squared. After this model is run, a prediction will be calculated for each 2013-2015 free agent in the dataset. The predicted value will equal the probability they would have received a Type A designation as a catcher regardless of their actual position.

Once predicted values are generated for each positional group model, the predictions are aggregated into one variable representing the probability of being designated as a Type A player. Note that when a player is present in multiple positional models, only the predicted value from his primary position is included in the combined variable.

5.1.2. Comparison of Type A Free Agents

Now that there is an estimate of who would have been a Type A player had the type designations remained in place, it is possible to compare their actual contract terms with their predicted contract terms derived from the true contract values of the 2008-2012 Type A free agents. In order to determine the effects of the new collective bargaining agreement, this study will compare the contract terms of predicted Type A players (in the 2013-2015 sample) with their predicted contract terms had the previous CBA remained in effect.

As outlined in section 4.2.3., *Z_lnAAV* & *Z_lnGrtdAmount* will be used to determine contract outcomes. The following models use the sample of 2008-2012

Type A free agents to estimate contract terms using average annual value and guaranteed amount.

$$Z\_lnAAV_i = \beta_0 + \beta_1 Z\_lnPrevSalary_i + \beta_2 WAR_i + \beta_3 WAR2_i + \beta_4 AllStar_i + \beta_5 Age_i + u_i \quad (9)$$

$$Z\_lnGrtdAmount_i = \beta_0 + \beta_1 Z\_lnPrevSalary_i + \beta_2 WAR_i + \beta_3 WAR2_i + \beta_4 AllStar_i + \beta_5 Age_i + u_i \quad (10)$$

In regression 9 the dependent variable is *Z_lnAAV* while in regression 10 the dependent variable is *Z_lnGrtdAmount*. This study expects that each of the coefficients (with the exception of Age) show a positive relationship between the variables and the designated contract outcome. Once these regressions are run, predictions for *Z_lnAAV & Z_lnGrtdAmount* are made for the 2013-2015 free agents in the dataset. This study uses the predicted values to compare predicted Type A contract outcomes using a t-test on a sample of free agents after the introduction of the new CBA. I expect to find an improvement in the contract terms (relative to other free agents) among players that would have been designated as Type A free agents from 2013-2015. This is because the new CBA removed the formal Type A designation system and the penalties that were associated with signing a Type A player. I expect the removal of these penalties to increase the demand for these high performance players.

5.2. *Type A Designation Empirical Results*

5.2.1. Modeling Type A Free Agents

Tables 10 and 11 show the results of regressions 4, 5, 6, 7, & 8 using the sample of free agent players from 2008-2012. Each regression represents a different positional group of free agents.

Table 10. Probability of Type A Designation among 2008-2012 Free Agent Pitchers

EQUATION	(4)	(5)
POSITIONAL GROUP	Starting Pitchers Model	Relief Pitchers Model
VARIABLES	Pr(TypeA)	Pr(TypeA)
TotalGames(SP/RP)*	0.0203	-0.0101*
	(0.0401)	(0.00565)
TotalGames(SP/RP)^2	-0.000835	0.000115**
	(0.000842)	(0.0000578)
TotalGames(SP/RP)2	-0.0523	-0.000727
	(0.0478)	(0.00698)
TotalGames(SP/RP)2^2	0.00146	0.0000352
	(0.00103)	(0.0000675)
IP	0.00748	0.000415
	(0.00816)	(0.00273)
IP^2	-0.00000623	0.00000352
	(0.0000263)	(0.0000115)
IP2	0.00188	0.00107
	(0.00869)	(0.00203)
IP2^2	-0.0000286	-0.00000452
	(0.0000301)	(0.00000743)
ERA	-0.00737	0.00217
	(0.0433)	(0.00159)
ERA2	0.0490*	0.0228**
	(0.0276)	(0.0105)
Wins	-0.142***	
	(0.0414)	
Wins^2	0.00686***	
	(0.00150)	
Wins2	-0.0443	
	(0.0480)	
Wins2^2	0.00395*	
	(0.00233)	
WLPercentage	0.701*	

	(0.359)	
WLPercentage2	0.0163	
	(0.243)	
Strikeouts	-0.00113	
	(0.00398)	
Strikeouts^2	0.00000382	
	(0.0000132)	
Strikeouts2	0.00826	
	(0.00562)	
Strikeouts2^2	-0.0000108	
	(0.0000212)	
WSaves		0.00359
		(0.00650)
WSaves^2		0.0000463
		(0.000110)
WSaves2		0.00104
		(0.00669)
WSaves2^2		0.0000456
		(0.000158)
IPHits		0.394***
		(0.106)
IPHits2		0.476***
		(0.128)
KBB		0.0669**
		(0.0285)
KBB2		0.0643***
		(0.0211)
Constant	-0.571	-1.158***
	(0.484)	(0.256)
Observations	99	231
R-squared	0.600	0.501

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

*Recall that Elias calculates TotalGames differently between starting and relief pitchers, therefore different variables are used in the separate regressions

Table 11. Probability of Type A Designation among 2008-2012 Free Agent Position Players

EQUATION	(6)	(7)	(8)
POSITIONAL GROUP	1B, OF, & DH Model	2B, 3B, & SS Model	Catcher Model
VARIABLES	Pr(TypeA)	Pr(TypeA)	Pr(TypeA)
PA	-0.0000472	-0.0000312***	-0.0000139
	(0.000558)	(0.000818)	(0.00136)
PA^2	-0.000000169	0.00000469***	0.00000317
	(0.000000716)	(0.00000118)	(0.00000298)
PA2	0.000440	0.000477	0.00138
	(0.000695)	(0.000937)	(0.00156)
$PA2^2$	0.000000182	-0.000000156	-0.00000239
	(0.000000851)	(0.00000123)	(0.00000202)
AVG	1.103*	0.00746	2.204
	(0.623)	(1.147)	(1.361)
AVG2	0.145	0.893	-0.512
	(0.759)	(1.054)	(0.916)
OBP	0.791	0.831	-1.450
	(0.597)	(0.895)	(1.209)
OBP2	0.434	0.384	1.882
	(0.712)	(1.002)	(1.247)
HR	0.00537	-0.000789	0.0134
	(0.00832)	(0.0135)	(0.0256)
HR^2	0.000144	0.000499	-0.00165
	(0.000260)	(0.000563)	(0.00160)
HR2	0.00399	0.0359**	0.0312
	(0.00777)	(0.0157)	(0.0330)
$HR2^2$	-0.000124	-0.00128**	-0.00109
	(0.000277)	(0.000634)	(0.00145)
RBI	-0.00954***	-0.000405	0.000484
	(0.00360)	(0.00628)	(0.00806)
RBI^2	0.000113***	-0.0000194	0.0000228

	(0.0000281)	(0.0000858)	(0.000190)
RBI2	-0.00736	-0.00678	-0.0186*
	(0.00484)	(0.00554)	(0.0109)
$RBI2^2$	0.0000461	0.000019	0.000297***
	(0.0000426)	(0.0000511)	(0.0000986)
FieldingPercentage		0.249	-0.723
		(1.277)	(3.082)
FieldingPercentage2		0.774	3.136
		(1.394)	(3.030)
TotalChances		0.000247	
		(0.000750)	
$TotalChances^2$		0.000000241	
		(0.00000105)	
TotalChances2		-0.000691	
		(0.000807)	
$TotalChances2^2$		0.000000709	
		(0.00000105)	
Assists			0.0127
			(0.0113)
$Assists^2$			-0.000156
			(0.000176)
Assists2			-0.00556
			(0.00638)
$Assists2^2$			0.0000372
			(0.0000673)
Constant	-0.555***	-1.173	-2.893
	(0.209)	(1.787)	(3.909)
Observations	224	133	80
R-squared	0.577	0.614	0.492

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Tables 10 and 11 show the estimates of the Type A prediction regressions for each of the five positional groups. With most of these variables the most recent year's performance has a greater and more significant effect on the probability of being a Type A free agent than does the data from two seasons ago. This demonstrates that Elias likely placed additional weight on more recent performance in their designations, despite never formally acknowledging doing so. Each of these regressions was used separately to calculate a predicted probability of Type A designation for each player in the dataset given the chosen positional group. Depending on the player's actual position an aggregate prediction variable was created using selections from the five previous positional group models. This predicted value will be used in the following section to draw conclusions about the relative well-being of Type A type players following the introduction of the 2012 collective bargaining agreement.

5.2.2. Comparison of Type A Free Agents

Table 12. AAV and Guaranteed Amount of 2008-12 Type A Free Agents

EQUATION	(9)	(10)
VARIABLES	Z_lnAAV	Z_lnGrtdAmount
Z_lnPrevSalary	0.344***	0.247*
	(0.0934)	(0.125)
WAR	0.176***	0.254***
	(0.0220)	(0.0310)
WAR2	-0.0234	-0.00351
	(0.0237)	(0.0434)
AllStar	0.0965	0.142
	(0.0937)	(0.150)
Age	-0.0383***	-0.0732***
	(0.0119)	(0.0184)
Constant	1.776***	2.785***
	(0.428)	(0.643)
Observations	111	109
R-squared	0.685	0.647

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 12 shows estimates of average annual value and guaranteed amount for 2008-2012 Type A free agents in regressions 9 and 10, respectively. In both regressions, *Z_lnPrevSalary, WAR,* and *Age* are all statistically significant in the hypothesized direction. *WAR* is larger than *WAR2,* again indicating a preference for more recent performance of players.

The results of these regressions are used to predict the contract outcomes of 2013-2015 free agents in the data set. Table 13 shows the result of the two sample t-tests using these predictions.

Table 13. Two Sample T-Test on Contract Outcomes of Predicted Type A Players

Variable	Obs	Mean	Std. Err.	Std. Dev.	T-Value	P-Value
Z_lnAAV	41	0.847401	0.1128684	0.7227101	-1.7443	0.0849
Z_lnAAV_Predicted	41	1.09022	0.0814831	0.5217466		
Z_lnGrtdAmount	40	0.8844069	0.1236097	0.7817766	-1.3086	0.1945
Z_lnGrtdAmount_Predicted	40	1.094839	0.102865	0.6505755		

These tests are run using the sample of predicted Type A players from section 5.2.1. Players were included if they had a predicted probability of receiving a Type A designation of greater than .5 and became free agents following the removal of the Elias designation system in the new CBA. Additionally, players must have entries of *AAV, WAR,* and *WAR2* to be included in this t-test. This is to ensure they have predicted contract outcome values. There is one additional entry for average annual value because one player signed a contract with an *AAV* but no guaranteed amount. The predicted contract outcomes are derived from regressions 9 and 10.

The results of the t-test show that Type A like players are receiving a normalized natural logarithmic annual average value mean of .8474 while under the old regime they could have expected to receive 1.0902. This difference is significant at a 90% confidence level as is indicated by the p-value of .0849. This indicates that Type A like players are now receiving worse *AAV* contract outcomes relative to their free agent peers in each season. Similar results are found for contract guaranteed amount, however the difference in these values is not statistically significant at a 90% confidence level. The direction of this difference also suggests that Type A like players are receiving worse contract outcomes relative to their peers following the introduction of the new CBA.

5.3. *Discussion*

This section of the study explored the hypothesis that the type of players previously designated as Type A free agents would have better contract outcomes following the removal of the Elias type designation system. This is because under the old system if a team signed a Type A free agent they would be required to forfeit a top draft pick. Now that the type designation is removed, assuming the player doesn't receive a qualifying offer, there is no draft pick forfeiture tied to their signing. I hypothesized that this would increase their value in the free agency market. The t-test in table 13 shows some evidence that predicted Type A players are receiving worse contract outcomes than would have been expected prior to the removal of the designation system. This is contrary to my expected hypothesis.

Shortcomings in this section of the study relate primarily to models 4-8. These are the models predicting the probability a player is a Type A free agent using the Elias Sports Bureau's publicly available information on the methodology of their rankings. While these models do take into account each variable announced by Elias (as well as squared terms for the variables) they are unable to perfectly predict Type A player designations. The final model correctly predicts 72 out of 115 Type A players from 2008-2012. This inaccuracy is most likely because in their rankings Elias uses statistics from each player in the league to create their ranking. Once that happens, the top 20% of players in each positional group are designated as Type A regardless of their contract status. This means that some years will have more Type A free agents than others. My model is therefore insufficient because it only draws comparisons among free agent players. Additionally, my constructed model is left vulnerable to league wide shifts in statistics. If one season is an abnormally offensively dominated

year, then players with good offensive statistics may still fail to receive a Type A designation from Elias due to the high level of play league wide. To account for these difficulties I suggest using a more expansive dataset that includes all players regardless of contract status. Future research could delve deeper into the ranking methodology to create a more accurate prediction of Type A players following the removal of the designation system.

One other potential explanation for the unexpected results involves the introduction of the qualifying offer system. It is possible that some of the players the model predicted would be Type A free agents were actually extended a qualifying offer. If this were the case then it is possible that the difference in contract outcomes could be accounted for by the overwhelming penalties on qualifying offer players. However, an additional t-test excluding players that received a qualifying offer limits the sample size to 28-29 players and still shows results in the opposite of the hypothesized direction. Future studies could do more to aggregate a prediction that accounts for both predicted Type A free agents as well as players extended a qualifying offer. Additional years of data may help increase the performance of these models. Note that the results of this section of the study only indicate that Type A players are receiving worse contract outcomes relative to the average among free agents league wide. They could still be doing better on the whole assuming that all players are experiencing gains. In fact, it is possible that the difference observed in Table 13 is the result of non-Type A players doing much better off and exceeding contract expectations. Nonetheless, this section of the study does demonstrate counter-intuitive evidence supporting the conclusion that predicted Type A players are receiving worse contract outcomes (relative to the rest of the league) following the introduction of the new CBA.

6. Conclusion

The introduction of a new collective bargaining agreement serves as a prime opportunity to explore the interactions between the different markets for player acquisition in major league baseball. The CBA provides a clear cutoff point in analysis for both the draft and free agency market. The new CBA imposes a host of new procedures that link the draft to free agency in a way never experienced before in baseball. The creation of strict draft bonus pools increases the value of having access to top picks in the draft. This increased value makes teams more reluctant to forfeit them in order to acquire top free agent talent. The elimination of the Elias designation system in favor of the qualifying offer reduces the number of players tied to draft pick compensation on the whole. However this shift could unintentionally harm some players while helping others in terms of contract negotiation. This study sought to uncover the effects on different groups of players in the MLB free agent market.

The results of this study provide evidence supporting the conclusion that certain players' financial well-being (relative to the rest of the league) has changed following the introduction of the new CBA. Chapter 4 explored the relative well-being of qualifying offer type players. This section first found that on average, players are making the correct long term financial decision in turning down the guaranteed qualifying offer in favor of a multi year contract. Simple comparisons showed that players got less in the first year of their new contract, however over time their average annual value exceeded the rejected qualifying offer. Then, using a model to predict qualifying offer type players, comparisons were drawn between their current well-being and what one would have expected had the old CBA remained in place. The results provide evidence that qualifying offer type players are doing worse now (relative to other free agents) following

the rule changes stemming from the CBA. These results are present for both contract measures: average annual value and guaranteed amount. It is unlikely the MLBPA foresaw this consequence when constructing the 2012 CBA.

Chapter 5 studied the relative financial well-being of players that either were, or would have been, designated as Type A free agents. Using the available information about the Elias ranking system I constructed 5 separate models (one for each positional group) attempting to predict the probability a given player received a Type A designation. Using an aggregate prediction, in conjunction with a contract outcome prediction, the results of this section of the study indicate that Type A players are doing worse (relative to the league in a given year) following the rule changes. This was the opposite of the expected hypothesis and the results are indicated by both contract outcome variables. This section of the study could however be greatly improved using an expanded dataset to construct the Type A predictions. It is also very unlikely that the MLBPA foresaw this consequence; however, these results could be partially explained by a general increase of contract terms for all free agents. If there has been a reduction of inequality among free agent contract outcomes, then Type A free agents could appear to be doing worse financially relative to the league. The MLBPA represents the interests of all major league players; therefore, it remains unclear if they have incentive to address the change in contract outcomes among Type A players.

Future research on this subject could benefit from additional years of analysis. This would help increase the number of qualifying player observations. Additionally, an expanded dataset to include all players in the MLB would help predict Type A players using the models in chapter 5 of this study. It would be interesting to explore other ways in which this CBA has impacted the free agent

market beyond top tier players (qualifying offer and Type A players). Exploring the distribution of money spent on players could provide insight into industry inequality trends. It would also be interesting to expand the scope of this study to include years prior to the formation of the 2007 collective bargaining agreement as well. Each new agreement could serve as a formal break point in statistical analysis, allowing implications to be drawn about the outcomes of each successive CBA.

This study examined the effects of the 2012 MLB CBA on the free agency market. The MLBPA and MLB owners currently use a five year cycle in negotiations. Therefore, they will next meet in 2016 to discuss the contents of the CBA to take effect at the start of 2017. The results of this study have implications that could carry over into the discussions in the next negotiations. It is unlikely the MLBPA will agree to the same qualifying offer system given its outright rejection by players as well as the market penalties players incur in turning down the offer. This study demonstrates evidence that players are financially harmed in the short term as a result of the qualifying offer system. I don't expect removal of the system in the next round of negotiations; however, I do expect they will take serious consideration of the fact that no players have accepted the offer.

To address the qualifying offer issue I expect the value of the qualifying offer will be increased by making it an average of only the top 100 MLB players instead of the top 125.[1] Additionally, they could simply remove the draft pick forfeiture for teams signing free agent players. Teams that extend a qualifying offer could still get compensation without forcing the signing team to pay a penalty. Section 4.1.2. of this study found that players are rejecting the qualifying offer on the grounds of protecting their long term financial interests. Another

[1] Cantania, J. (2014, November 15). How to Fix Qualifying Offer Dilemma in MLB.

suggestion for addressing the qualifying offer problem would be to extend the offer to a two year contract instead of only one.[2] This would help address players' preference for contract security. Instituting these changes could help encourage players to accept the qualifying offers and cleanse the free agent market of inefficiencies.

Negotiation between labor unions and owners will always present challenges due to the many different interests of parties involved. The MLBPA and MLB owners have presided over a prosperous decade without work stoppage, and I don't expect this to end due to the recent changes to the free agency market. Inefficiencies exist in the market, and I expect the negotiating parties to make the necessary changes to account for the current unforeseen consequences in the next round of bargaining.

[2] Cantania, J. (2014, November 15). How to Fix Qualifying Offer Dilemma in MLB.

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