

# Player Performance in Their Contract Year

## *A Study of MLB Free Agents from 1978-2003*

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### Abstract

Today in Major League Baseball, it is not uncommon for players to sign multimillion dollar contracts spread over several years. Due to these high rewards, there may be some interesting incentive effects created that affect player performance from year to year. Casual observers have begun to notice an increase in player performance during their contract year, as players are attempting to gain a more favorable bargaining position during contract negotiations. The best example of this can be seen in the performance of Adrian Beltre, a former third baseman for the Los Angeles Dodgers. In the year he became a free agent, 2004, Adrian hit 48 home runs, batted .334 and had 121 RBIs. His career average for those statistical categories are 24, .271 and 86 respectively. In all, he set career highs in 8 of the offensive statistical categories. In 2005, Beltre signed a five-year, \$64 million dollar contract with the Seattle Mariners. Unfortunately for the Mariners, Beltre's performance dropped significantly in his first season with them, putting up numbers that more closely resembled his career averages.

Adrian Beltre provides only anecdotal evidence of MLB players reacting to the incentive effects created by free agency and guaranteed contracts. In this paper, players who became free agents in the years 1978-2003 will be examined. If there is evidence provided by this study that supports this theory of player performances, then there are implications that can be useful to league management when negotiating free agent contracts.

## **Introduction**

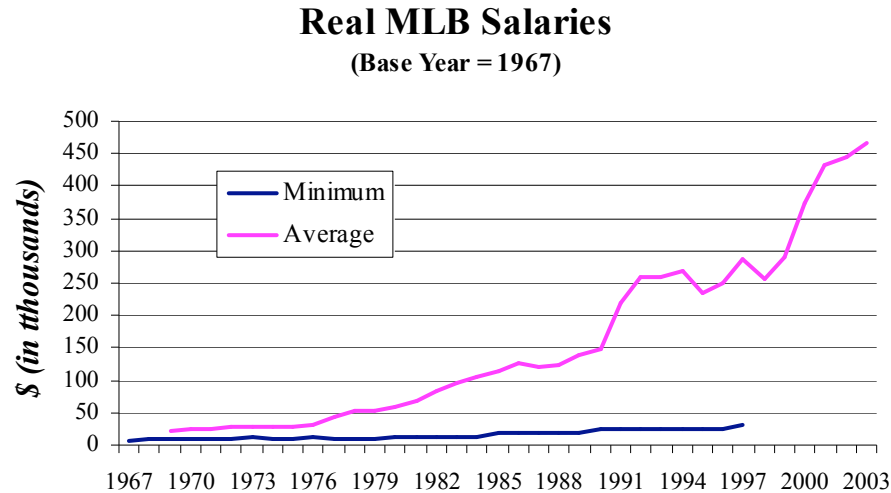
Since free agency began in 1975, Major League Baseball players have been able to negotiate their contracts in an environment that is very close to a free market. Before this time, professional baseball players' salaries were suppressed by a reserve clause in their contracts. Under this system, teams owned the rights to players for indefinite periods and players accepted the contract of the team owner, retired or played for a rival league.

In 1976, the collective bargaining agreement, which created free agency, allowed a player with six years of major league service to be eligible for free agency. In this setting, up to 12 teams were allowed to submit bids for a player's services and players with three years of service, but less than six, were eligible for salary arbitration. During salary arbitration, the team owner and player submit a suggested salary and an independent arbitrator decides which salary the player receives based on these suggestions.

Figure 1 below displays the real average and minimum salaries of baseball players from 1967-1997. Notice the increase in the rate of growth of average player salaries since 1976 relative to the minimum salaries, the year free agency began in the league. In 1976, the average salary was \$51,500, but by 1997 it had risen to about \$1.38 million, an increase of 2500%. This may be occurring due to the fact star players are negotiating richer contracts, perhaps forcing teams to cut back on other player salaries. According to a 2002 article from USA Today, 60% of players in Major League Baseball took home only 35% of league total payroll. This compares to the 41% they received in 1988. In

addition, about 260 players, about one-third of all players, earned salaries below \$300,000 in 2002.<sup>1</sup>

**Figure 1**



Another factor involving MLB player performance and salaries is the structure of their contracts. Most MLB player contracts are guaranteed, meaning that the player receives the salary defined in the contract regardless of actual performance. For example, Darren Dreifort of the Los Angeles Dodgers earned \$11,400,000 in 2005 without throwing a single pitch.<sup>2</sup> In other professional leagues, like the NFL, contracts are incentive laden and pay players a salary more according to their performance. MLB player contracts leave only contract buyout options - a clause that allows team management to release a player while only having to pay a portion of his salary - as an outlet for teams to minimize losses due to underperforming players. Due to current negotiating framework under free agency and the structure of player contracts, incentives

<sup>1</sup> Weir, Tom and MaryJo Sylwester. *Baseball salaries top-heavy*. USA TODAY Magazine. October 16, 2006. [http://asp.usatoday.com/sports/baseball/salaries/2002-10-16-analysis\\_x.htm](http://asp.usatoday.com/sports/baseball/salaries/2002-10-16-analysis_x.htm)

<sup>2</sup> ESPN.com

may not only exist for players to increase their performance during their contract year, but also decrease their performance after signing.

Ahlstrom (2004) focused on MLB players, specifically batters, who were granted free agency in the years from 1976 to 1992. The focus of their study was to test the hypothesis of player performance based on two theories: equity and expectancy. The equity theory involved players who felt they were relatively uncompensated and, as a result, would reduce their effort. The expectancy theory describes players “going all out” in order to improve their bargaining positions. They use data for the year prior, year of and year after free agency. They found no evidence supporting equity theory, but some evidence supporting expectancy theory. They concluded that, based on expectancy theory, players would increase their effort levels in their contract years in order to reap greater rewards, in the form of richer contracts.

Maxcy (2002) investigates this principal-agent problem, existing between players and team management, in Major League Baseball. He compares performance of players nearing contract negotiations and other players to detect any strategic behavior before or after the contract is signed. The paper considers several types of statistics in an attempt to examine the player’s desire to play as well as his performance once he enters the game. The data used in this study does not find evidence for strategic behavior for players; yet there is some evidence found that implies pitchers with nagging injuries are more likely to be placed on the disabled list while under long term contracts.

If players do indeed react to these incentives described above then there will be an increase in the performance of players in the year they are granted free agency. In

addition, due to the composition of MLB player contracts, a decrease in performance in the years following a signing of a free agent contract will be expected.

An additional inefficiency that can arise from this problem is an overcompensation of free agents and possibly all players in general. If players do indeed react to these free agency incentives, and team management does not correct for this behavior, then players will be perceived as having more ability and potential and be paid more than they are worth. Often when players are negotiating new contracts, player agents will compare their client to similar players and demand similar contracts. In order to examine this possibility, it is necessary to examine player salaries and performance before and after free agency. If player salaries have increased greater than performance since free agency, then it is possible that players are being overcompensated for their ability.

### **Regression Model**

To further demonstrate evidence of a change in performance of professional baseball players in their contract year relative to other years, an econometrics approach can be taken. Equation (1) presents a possible model for determining the impact of the incentives of pending free agency on player performance:

$$(1) Y_t = \alpha_0 + \beta_1 X + \beta_3 F_1 + \epsilon_t$$

where  $Y_t$  is the dependent performance measure variable,  $(Y_{t-1} + \dots + Y_{t-n})$  is a measure of performance in past seasons,  $X_1$  represents a series of explanatory variables,  $F_1$  equals one during the year before a player is granted free agency and zero otherwise, and  $\epsilon_t$  is

the error term. A positive and significant sign for  $\beta_3$  would indicate there is an increase in the performance of a player during their contract year.

The dependent performance variable,  $Y_t$ , can be represented by several performance variables, including batting average, on-base percentage and slugging percentage. The primary measure of performance currently used in major league baseball is batting average. Batting average (AVG) measures how frequently a batter got on base by using his hitting skills. It is calculated by dividing the number of times the player hit safely (single, double, triple or home run) by the number of at-bats:

$$AVG = (Number\ of\ Times\ Hit\ Safely) \div (At-bats)$$

On-base percentage (OBP), which is calculated by dividing the number of times a hitter got on base by the number of plate appearances:

$$OBP = (Hits + Walks + Hit\ by\ Pitch) \div (At-bats + Walks + Sacrifices + Hit\ by\ Pitch)$$

On-base percentage is sometimes considered to be more useful than batting average because it measures the total number of times a hitter gets on base safely. By adding the number of walks, sacrifice hits and hit by pitches to the numerator and walks and hit by pitches to the denominator.

Slugging percentage (SLG) is calculated by dividing the number of total bases by the number of at-bats. This statistic is intended to calculate a player's ability to hit for power. Total bases are calculated by identifying the totals of each type of hit created by the player and multiplying each type of hit by the number of bases gained for that hit. The four types of hits are singles (one base), doubles (two bases), triples (three bases) and home runs (four bases).<sup>3</sup>

$$SLG = Total\ Bases \div At-bats - OR - [Singles + (Doubles*2) +$$

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<sup>3</sup> All statistic definitions acquired from MLB.com.

$$(\text{Triples} * 3) + (\text{Home Runs} * 4) \div \text{At-bats}$$

The last two performance measures examined that can be used are number strikeouts and home runs. In order to standardize both of these variables, the totals will be divided by the number of at-bats.

Table 1 displays the variables along with abbreviations that will be used in the regressions and variable definitions.

**Table 1**  
**Variables, Abbreviations and Definitions**

**Dependent Variables**

Batting Average (AVG)	number of times hit safely over at-bats
On-base Percentage (OBP)	sum of the number of hits, walks and hit by pitches divided by the number of at-bats, hits, sacrifices and hit by pitches
Slugging Percentage (SLG)	number of total bases divided by at-bats
Strike-outs (SOAB)	number of total strikeouts divided by at-bats
Home runs (HRAB)	number of total home runs divided by at-bats

**Independent Explanatory Variables**

Age (AGE)	Age , in years
Years of MLB Experience (MLB)	years of MLB experience
Outfield, First Base or DH (OF)	dummy variable, equal to one if player is an outfielder, first basemen or designated hitter
Number of Positions (POS)	Number of positions played during Season
Number of Games Played (G)	number of games played during season
Number of At-bats (AB)	number of at-bats during season
Played in the AL (AL)	dummy variable, equal to one if player played in the American League
Free Agent (FREE)	Dummy variable, equal to one if player became free agent at the end of that year

If players do react to incentives created by free agency, then there would be a statistically significant increase in almost all of these performance measures in the year they become a free agent. Strikeouts are not considered desirable for a hitter to acquire and would thus be hypothesized to decrease in a player's contract year. In addition, if players do decrease their effort after they sign a free agency contract due to the

guaranteed salary, then there will be an expected decrease in all of these performance measures, except for strikeouts, in the years after free agency.

Equation 2 displays a possible specification using batting average as the dependent performance variable and age, years of MLB experience, number of positions played, games played, at-bats, AL dummy variable, team winning percentage and the free agent dummy variable.

$$(2) \text{AVG} = \alpha_1 + \beta_1 \text{AGE} + \beta_2 \text{MLB} + \beta_3 \text{POS} + \beta_4 \text{GP} + \beta_5 \text{AB} + \beta_6 \text{AL} \\ + \beta_7 \text{WPCT} + \beta_8 \text{FREE}$$

The series of independent explanatory variables can be broken down into two types: player and team variables. Presumably a player's performance is both affected by his ability as well as the ability of his teammates. For example, if a player is the only good player on a very bad team, teams will not be afraid of "pitching around" him - avoid giving him good pitches to hit, therefore increasing the likelihood of walking him. Barry Bonds is an example of this as teams do not hesitate to intentionally walk him because they do not fear pitching to anyone else on his team. The reverse is true if a player is on a very good team, as pitchers will not want to walk a player and put him on base if there are other capable batters in the lineup. This will cause pitchers to throw more strikes, effectively increasing the number of hittable pitches for each batter. Therefore, the better team a player is on, the better he will do. Variables that can be used to describe how good a team is include the team's winning percentage and their final placing in their division's standings at the end of the season.

Variables that affect the ability of a player include: the player's age; number of years of MLB experience, whether or not they are an outfielder, first-baseman or

designated hitter (positions with little demand for defensive skills, allowing players to focus on their hitting), how many positions they played throughout the season (presumably the more positions they play the more likely they are a defensive specialist and spend more time improving their defensive skills), the number of games played, the number of at bats; whether they played in the AL that year (accounting for league differences in rules), and whether or not they bat left or right.

The variables for team win percentage, whether or not they play outfield/1<sup>st</sup> base/DH, number of games played, number of at-bats, team ranking and whether they play in the AL are all expected to be positive. This means as the value of each independent variable increases, the value of the dependent variable increases. The variable for number of positions, age and years of MLB experience played during the season is expected to have a negative relationship. It is unclear what the expected signs of the coefficients for games played and at-bats because as there may be diminishing marginal returns to each of these variables

### **Data Analysis**

The means of all of these performance variables were calculated for each year. Matched-pair means tests were performed in order to determine if the means of each performance measures were statistically different in the year of free agency to the two years prior and after. The data includes MLB players that became free agents from 1997-2005 and played in at least 81 games in each season. Figures 1-6 in the appendix display graphically the means of all the performance variables in three time periods.

**Table 1**

**Mean Data Analysis (1978-2003)**

		2 years prior	1 year prior	Free Agency	1 year after	2 years after
<b>AVG</b>	Mean	0.270	0.270	0.274	0.267	0.262
	Difference	0.004	0.004		0.007	0.012
	t-stat	1.319	1.301		<b>2.367</b>	<b>4.123</b>
<b>OBP</b>	Mean	0.339	0.338	0.342	0.338	0.332
	Difference	0.003	0.004		0.004	0.010
	t-stat	1.165	1.571		<b>1.692</b>	<b>3.637</b>
<b>SLG</b>	Mean	0.416	0.417	0.427	0.415	0.408
	Difference	0.011	0.010		0.012	0.019
	t-stat	<b>2.202</b>	<b>2.124</b>		<b>2.485</b>	<b>3.826</b>
<b>SO/AB</b>	Mean	0.173	0.173	0.163	0.159	0.160
	Difference	-0.010	-0.010		0.004	0.003
	t-stat	-0.905	-0.796		1.074	0.764
<b>HR/AB</b>	Mean	0.030	0.032	0.032	0.029	0.030
	Difference	0.002	0.000		0.002	0.002
	t-stat	0.959	0.076		<b>1.733</b>	1.489

significant at 10% level

significant at 5% level

significant at 2.5% level

significant at 1% level

Table 1 displays the mean data analysis MLB players who became free agents during the time period of 1978-2003. The data here indicates that there was significant difference between the means of slugging percentage in each season. In addition, there was a significant difference between the free agent year and the two years after for the performance measures of batting average and on-base percentage. This indicates that there may be some level of shirking by free agents once they have signed their guaranteed contracts. There was little or no difference between the means of strikeouts and home runs per at-bat for this time period.

Table 2

**Mean Data Analysis (1978-1991)**

		2 years prior	1 year prior	Free Agency	1 year after	2 years after
<b>AVG</b>	Mean	0.262	0.265	0.266	0.262	0.254
	Difference	0.003	0.001		0.004	0.011
	t-stat	0.951	0.305		1.089	<b>3.289</b>
<b>OBP</b>	Mean	0.331	0.332	0.335	0.332	0.325
	Difference	0.004	0.003		0.004	0.011
	t-stat	1.320	0.917		1.074	<b>2.831</b>
<b>SLG</b>	Mean	0.339	0.338	0.342	0.338	0.332
	Difference	0.003	0.004		0.004	0.010
	t-stat	1.320	0.917		1.074	<b>2.831</b>
<b>SO/AB</b>	Mean	0.148	0.147	0.155	0.150	0.154
	Difference	0.007	0.008		0.005	0.001
	t-stat	<b>1.854</b>	<b>2.586</b>		1.644	0.273
<b>HR/AB</b>	Mean	0.023	0.024	0.026	0.025	0.025
	Difference	0.003	0.001		0.004	0.011
	t-stat	0.951	0.305		1.089	<b>3.289</b>

significant at 10% level

significant at 5% level

significant at 2.5% level

significant at 1% level

Table 2 displays the mean data analysis of the various performance measures for players who became free agents in the time period of 1978-1991. There is only significant difference between two years after free agency and the free agent year for the batting average, on-base percentage, slugging percentage and home-runs per at-bat performance measures. There are also significant differences between strikeouts per at-bat the two years prior to free agency. What is surprising is that there are more strikeouts per at-bat in the free agency year. A reason for this may be that players are swinging harder and more often in order to boost their offensive performance measures in the year they become free agents.

**Table 3**

**Mean Data Analysis (1997-2003)**

		<b>2 years prior</b>	<b>1 year prior</b>	<b>Free Agency</b>	<b>1 year after</b>	<b>2 years after</b>
<b>AVG</b>	Mean	0.283	0.280	0.288	0.276	0.275
	Difference	0.005	0.008		0.012	0.013
	t-stat	0.909	1.602		<b>2.315</b>	<b>2.484</b>
<b>OBP</b>	Mean	0.354	0.349	0.354	0.349	0.346
	Difference	0.000	0.006		0.005	0.009
	t-stat	0.109	1.500		1.463	<b>2.344</b>
<b>SLG</b>	Mean	0.470	0.454	0.470	0.454	0.455
	Difference	0.001	0.017		0.016	0.016
	t-stat	0.069	<b>2.051</b>		<b>1.946</b>	<b>1.729</b>
<b>SO/AB</b>	Mean	0.217	0.217	0.178	0.174	0.170
	Difference	-0.039	-0.039		0.005	0.009
	t-stat	-1.263	-1.157		0.478	0.902
<b>HR/AB</b>	Mean	0.042	0.045	0.042	0.037	0.038
	Difference	0.000	-0.003		0.004	0.004
	t-stat	0.016	-0.356		1.327	1.062

significant at 10% level

significant at 5% level

significant at 2.5% level

significant at 1% level

Table 3 displays the mean data analysis for players who became free agents from 1997-2003. This is the period directly after the 1994 player's strike, which ended with the signing of a collective bargaining agreement that favored players with an increase in the salary cap and more methods that redistributed wealth around the league. There are significant differences in the means of the batting average performance measure for the two years after free agency and the free agency year. There is a significant difference between the on-base percentage for two years after free agency and the free agency year. There is also a significant difference between the slugging percentage mean for one year prior and the two years after free agency and the year of free agency. There was no statistical significance between the means of the strikeouts and home runs per at-bat performance measures.

## Regression Results

Regressions were performed according to the specification described in Equation (2) and data for the five years of data, including the free agent year, of the 88 players in the data set who became free agents from 1997-2003.

**Table 4**

### Post Strike Player Performance

<b>Dependent Variable:</b> Batting Average (AVG)			
<b>Method:</b> Least Squares			
<b>Observations:</b> 431			
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>
<b>C</b>	0.352	0.031	11.31615****
<b>AGE</b>	-0.004	0.001	-3.80598****
<b>MLB</b>	0.004	0.001	3.272708****
<b>POS</b>	-0.012	0.005	-2.454723***
<b>G</b>	0.000	0.000	-0.314
<b>AB</b>	0.000	0.000	1.985192**
<b>AL</b>	0.008	0.003	2.295999***
<b>WPT</b>	0.031	0.023	1.310
<b>FREE</b>	0.007	0.004	1.712430*
<b>R-squared</b>	0.118		
<b>Adjusted R-squared</b>	0.101		

\*\*\*\* = significant at 1% level

\*\*\* = significant at 2.5% level

\*\* = significant at 5% level

\* = significant at 10% level

Table 4 displays the regression results for the batting average performance measure. All variables are significant except for the variables for games played and whether or not the player played in the American League. The free agency variable was significant at the 10% level and positive, suggesting that there is some improvement in performance in the contract year.

Table 5

**Post Strike Player Performance**

<b>Dependent Variable:</b> Slugging Percentage (SLG)			
<b>Method:</b> Least Squares			
<b>Observations:</b> 431			
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>
<b>C</b>	0.545	0.077	7.088652****
<b>AGE</b>	-0.010	0.003	-3.56675****
<b>MLB</b>	0.012	0.003	4.433634****
<b>POS</b>	-0.027	0.012	-2.195797**
<b>G</b>	0.001	0.000	2.027869**
<b>AB</b>	0.000	0.000	0.681
<b>AL</b>	0.022	0.008	2.621885***
<b>WPT</b>	0.040	0.058	0.697
<b>FREE</b>	0.004	0.010	0.348
<b>R-squared</b>	0.136		
<b>Adjusted R-squared</b>	0.120		

\*\*\*\* = significant at 1% level

\*\*\* = significant at 2.5% level

\*\* = significant at 5% level

\* = significant at 10% level

Table 5 displays the regression results for slugging percentage performance measure. The coefficients for the several variables are almost all significant with expected signs, excluding number of at-bats, team winning percentage and the free agency variable.

Table 7

**Post Strike Player Performance**

<b>Dependent Variable:</b> On-base Percentage (OB)			
<b>Method:</b> Least Squares			
<b>Observations:</b> 431			
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>
<b>C</b>	0.383	0.035	10.93353****
<b>AGE</b>	-0.005	0.001	-3.96252****
<b>MLB</b>	0.006	0.001	4.834983****
<b>POS</b>	-0.011	0.006	-2.018410**
<b>G</b>	0.000	0.000	2.205750**
<b>AB</b>	0.000	0.000	-0.028
<b>AL</b>	0.013	0.004	3.397729****
<b>WPT</b>	0.054	0.026	2.042823**
<b>FREE</b>	0.000	0.005	0.081
<b>R-squared</b>	0.147		
<b>Adjusted R-squared</b>	0.131		

- \*\*\*\* = significant at 1% level
- \*\*\* = significant at 2.5% level
- \*\* = significant at 5% level
- \* = significant at 10% level

Table 7 displays the regression results for the on-base percentage performance measure. The only two coefficients that are not significant are the ones for the number of at-bats and free agency variables.

**Discussion**

The mean data analysis provided some evidence that suggested there is an increase in performance during the season that a MLB player is eligible for free agency. The regression result for the batting average performance

measure also provided additional evidence for the spike in performance during free agent years.

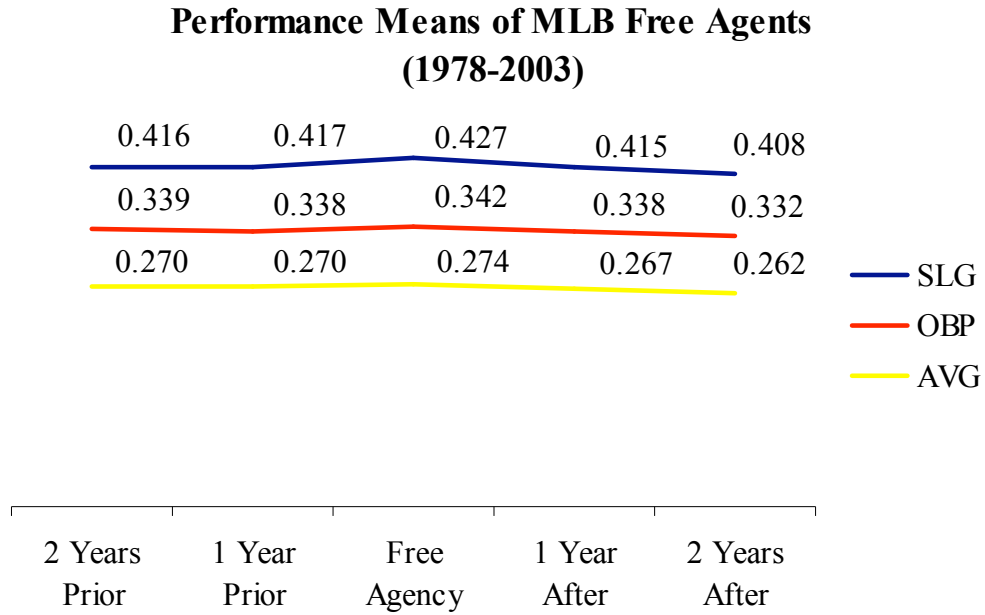
This evidence can provide league management a useful tool when negotiating contracts with future free agents. If they know that there is a likelihood that players will perform based on these free agent incentive effects, then they can be justified in focusing more on the player's performance over his career rather than putting considerable weight on the performance in his contract year. Management can also push for the creation of contracts that incentive include incentives for players to perform well, in order to avoid a sharp decline in performance immediately following the signing of a contract.

In order to provide more evidence, future studies researching this subject can perform regressions with data for players before 1997. In addition, it may be useful to expand the data set to years prior to free agency, in order to determine if there are significant increases in performance when players were less able to negotiate contracts. The inclusion of other variables, such as whether or not a player changed teams during a season, to the regression specification may also provide a better estimate of what effects each variable has on player performance.

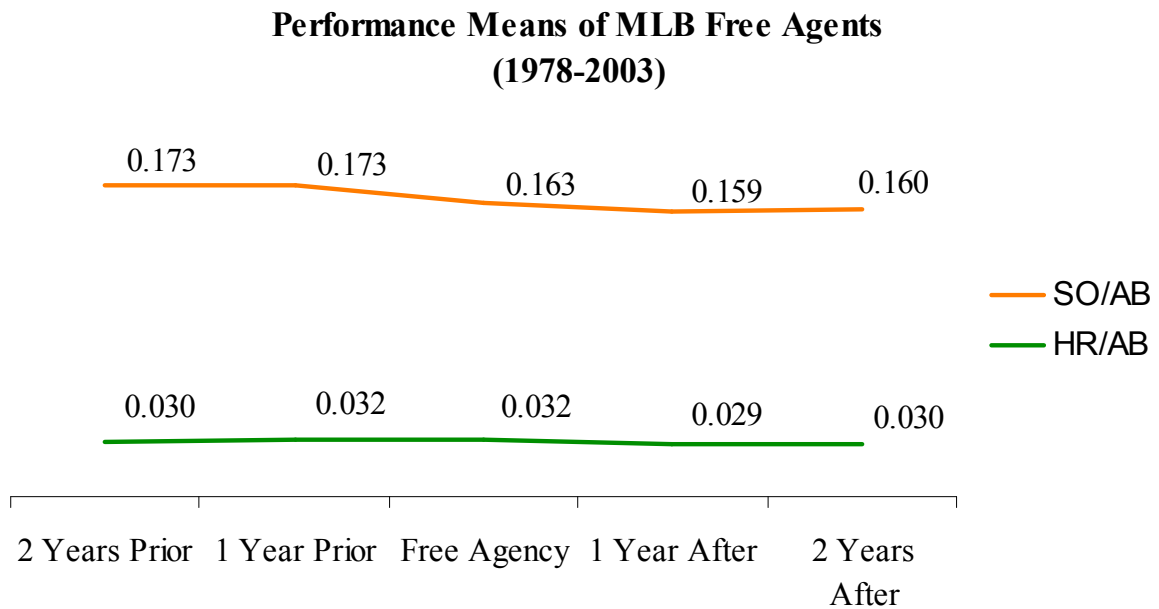


## Appendix

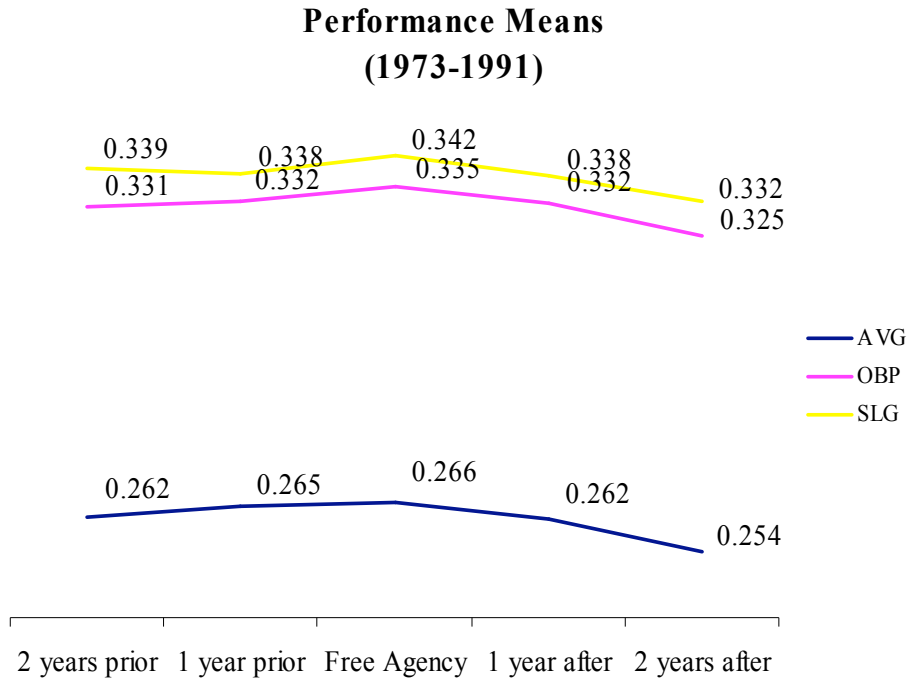
**Figure 1**



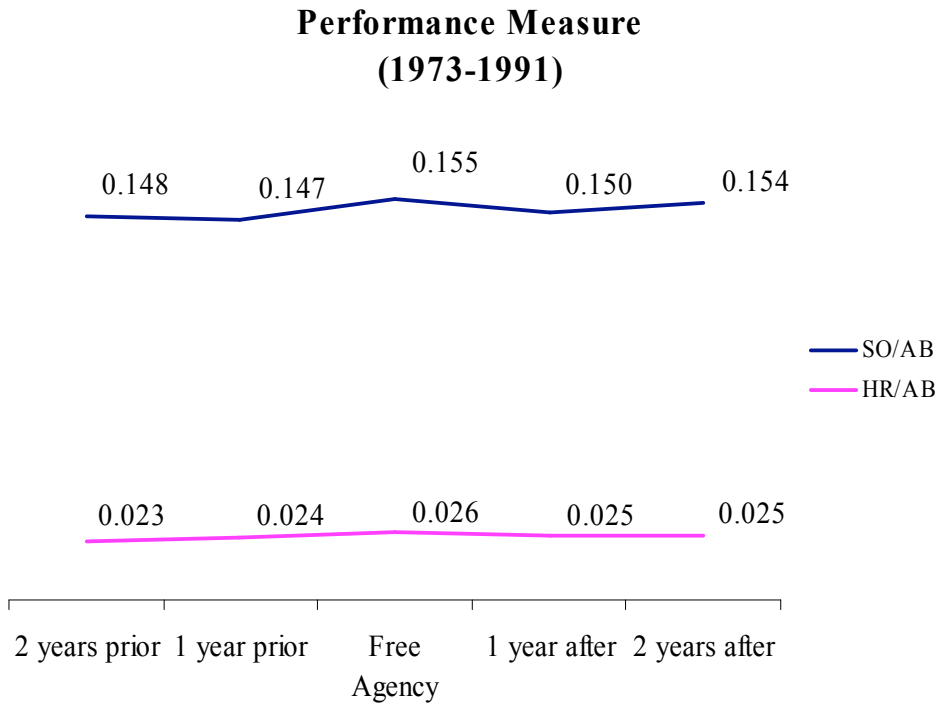
**Figure 2**



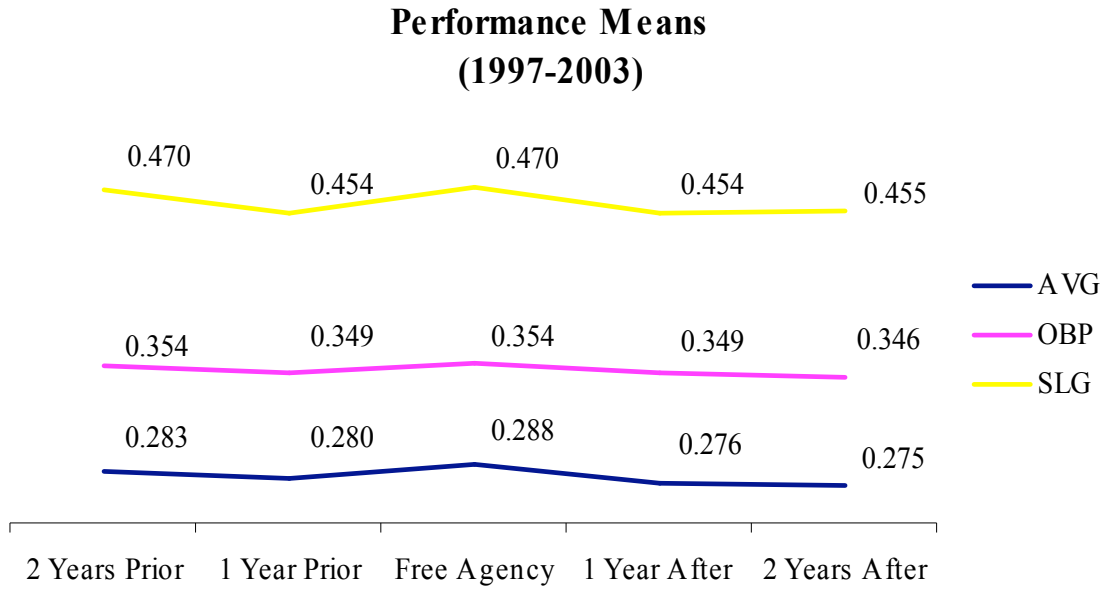
**Figure 3**



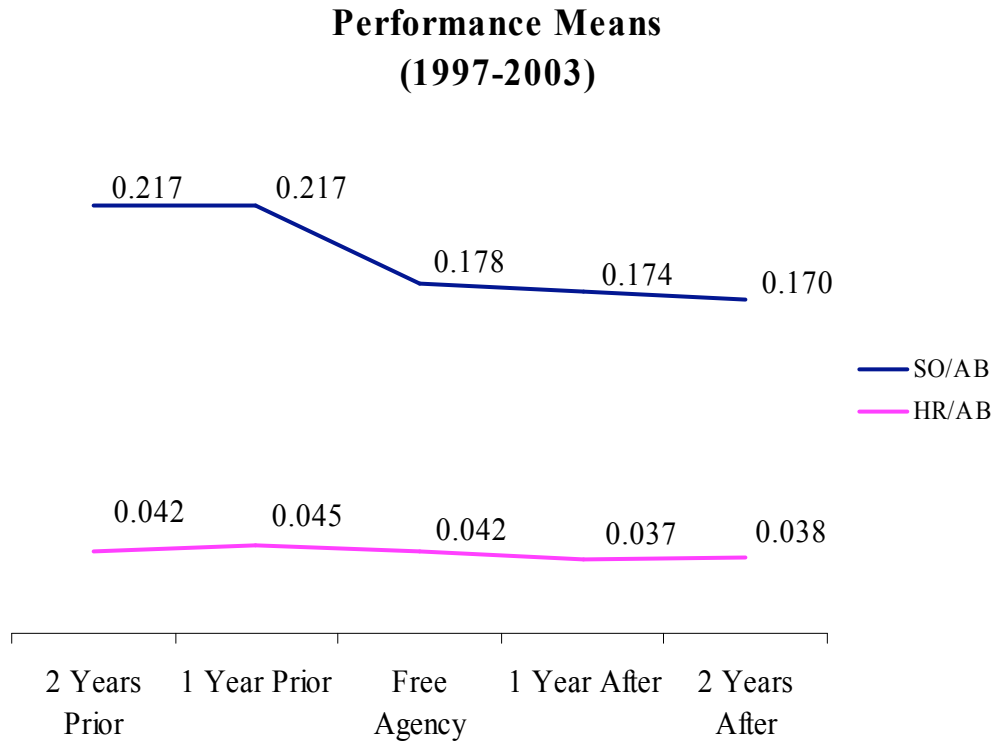
**Figure 4**



**Figure 5**



**Figure 6**



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