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# The Indian Premier League: What are the factors that determine player value?

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CLAREMONT MCKENNA COLLEGE

**The Indian Premier League:  
What are the factors that determine player value?**

SUBMITTED TO

Professor Janet K. Smith

AND

DEAN NICHOLAS WARNER

BY

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for

SENIOR THESIS

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**Abstract**

This paper examines and tries to estimate the importance of various characteristics that go into attributing specific dollar values to cricketers. The auction process employed in the Indian Premier League enables one to associate players with specific monetary values and this paper uses various performance criteria to assess what the key variables are towards creating a highly valued cricket player. This paper finds that various batting statistics are of significance in addition to the age and nationality of players.

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## **Introduction**

Many comparisons have been made between baseball and cricket because they are both invasion based team sports. However, the wages paid to players in each sport are largely dissimilar. Cricket players earn very low salaries compared to baseball players and players from other professional sports. Cricket players enter a monopsonistic labor market because, with a few exceptions, an individual player is qualified to represent only one country. Therefore, he cannot garner his revenue as a proportion of say broadcasting rights and other revenue streams, which is what traditionally happens in sports with more competitive labor markets. Thus, cricket governing bodies are able to maintain control of economic rents. An analysis of the payment schemes set up between both the Australia Cricket Board(ACB) and the English Cricket Board(ECB) and its players shows that the cricket boards have two methods of payments for their players, depending on whether the players are contracted or not. The core players of their international teams are generally contracted and are paid a fixed fee per annum. However, their ever-present players are paid a fee for participation in either a one day match or T-20 cricket match. These match fees are adjusted accordingly to reflect the value of the contract<sup>1</sup>. These contracts seem to be based on what the cricket boards decide players are worth without necessarily taking into account their ability to capture the audience's attention or other revenue streams. Additionally, the value of these contracts does not seem to deeply consider variation in player skill levels.

The Indian Premier League introduced an auction for cricketers for the first time in the history of the sport. Due to the auction and bidding process monetary values were

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<sup>1</sup> Andreff, Wladimir, and Stefan Szymanski. *Handbook on the Economics of Sport*. Cheltenham, UK: Edward Elgar, 2006. Print.

associated with cricket players for the first time. This created an open market place to assess a cricket player's worth<sup>2</sup>. Due to this change, the labor market for cricketers became a lot more competitive and players were able to finally get the revenues that they actually deserved and would have gotten had the cricket labor market resembled those of other professional sports. For example, in the first IPL auction Gautam Gambhir was sold to the Delhi Daredevils for US \$2.4 million. <sup>3</sup>Had he only played cricket for the Indian cricket team he would have never secured a revenue stream of that amount, this can be seen when looking at his salary from the Board of Control of Cricket in India (BCCI) which is around \$186,000 per annum for 2013<sup>4</sup>.

This paper seeks to determine what characteristics determine the monetary values assigned to these players. This paper attempts to identify which of the player's skills and abilities are most valued when deciding to acquire them and at what price. Are players who bat more valued than players who bowl? Is age of the player an important criterion when making buying and pricing decisions? Do players from particular countries earn premiums over other players? This paper seeks to address these questions and provide explanations for the answers.

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<sup>2</sup> Karnik, Ajit. "Valuing Cricketers Using Hedonic Price Models." *Journal of Sports Economics* 11.4 (2009): 456-69. Web.

<sup>3</sup> "Indian Premier League (IPL)." *Encyclopaedia Britannica. Encyclopaedia Britannica Online Academic Edition*. Encyclopaedia Britannica Inc., 2013. Web. 02 Dec. 2013

<sup>4</sup> "Indian Cricketer's Salary 2013." *Paycheck.in*. N.p., n.d. Web. 02 Dec. 2013.



## **Literature Review**

Before the introduction of the Indian Premier League (IPL) there was no mechanism to assess the key factors that determine a cricketer's success. However with the introduction of the IPL, models like the hedonic pricing model became available to assess characteristics that determine player value. This literature review will first focus on the research that was conducted on factors that determine a cricketer's success before the IPL. It will then look at research that was conducted on the subject after the introduction and implementation of the IPL.

Booroah and Mangan (2010) create methodologies used in current academic literature to rank players. Through their research on batsmen performance in test matches they created a system that focused on various aspects of performance and ranked players according to their adjusted batting averages. They believed that batting averages alone were not a good indicator of a player's skill level and hence wanted to construct a measure that took into account the consistency of their scores across innings. They also felt that the batting average statistic did not take into account the 'value' of the player's runs to the team<sup>5</sup>. They constructed various statistics to combat the two problems mentioned above and when they reorganized the top fifty batsmen according to this new methodology they found a significant amount of variation in player rankings. Although this paper only focuses on batsman and their batting averages, it demonstrates that there are various methods that can be employed in ranking players and determining what factors make them successful. Barr and Kantor (2004) did similar research on batsmen in

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<sup>5</sup> Booroah, Vani K., and John E. Mangan. "The "Bradman Class": An Exploration of Some Issues in the Evaluation of Batsmen for Test Matches, 1877-2006." *Journal of Quantitative Analysis in Sports* 6.3 (2010): n. pag. Print.

one-day cricket and found that in addition to batting averages it is the rate at which batsmen score these runs i.e their strike rate, which is calculated as:  $100 * (\text{runs scored} / \text{balls faced})$ <sup>6</sup> that is important as well. In one-day cricket each team faces a limited amount of balls and hence the rate of run conversion has to be very high and efficient. Barr and Kantor use a two dimensional model where they construct a risk-return analysis on a batsman's performance. They use the strike rate of a batsman as a proxy for 'return' and they use the probability of getting out as a proxy for 'risk'<sup>7</sup>. Rohde (2011) took Barr and Kantor's framework a step further by assigning cardinal rankings to both the previously mentioned determinants. In order to generate non-arbitrary weightings for batting success he applies the concepts of opportunity cost and economic profit to Barr and Kantor's risk-return model<sup>8</sup>.

Most of the relevant literature prior to the IPL focuses on specific aspects of player performance and skill and does not quantify or assign monetary values to any of those skills. However, this prior research set the stage for the further studies that were conducted in the field of cricket once the IPL was introduced. The auction process in the IPL allowed for monetary values to be associated with cricket players. This change in the cricket labor market conditions created a lot of new research and allowed models like the hedonic price model to be applied to cricket. In turn, this allowed researchers to obtain monetary values for player characteristics. Hedonic price models are used to relate the price paid for a good to the characteristics that define it. Hence, researchers obtain an

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<sup>6</sup> [http://en.wikipedia.org/wiki/Cricket\\_statistics](http://en.wikipedia.org/wiki/Cricket_statistics)

<sup>7</sup> Barr, G D I., and B. S. Kantor. "A Criterion for Comparing and Selecting Batsmen in Limited Overs Cricket." *Journal of the Operational Research Society* 55.12 (2004): 1266-274. Print.

<sup>8</sup> Rohde, Nicholas. "An "Economic" Ranking of Batters in Test Cricket\*." *Economic Papers: A Journal of Applied Economics and Policy* 30.4 (2011): 455-65. Print.

estimated value for each of the characteristics. This idea stems from Lancaster's notion of a good as a bundle of characteristics. The rationale to use hedonic pricing functions to estimate the implicit values of characteristics of goods was provided by Rosen in 1974.<sup>9</sup> Karnik (2009) uses hedonic models to determine willingness to pay for players with respect to the franchise owners. He uses the data on prices of cricketers generated by the IPL auction along with cricketing statistics to identify the factors that determine the prices that were paid for cricketers. He narrows all the player characteristics to only a few variables by using the Levine and Renelt Extreme Bounds Analysis approach, which sets up a base-level regression equation in which regressors are chosen on the basis of an underlying theory. In this case the underlying theory for the value of a cricketer is player performance. Karnik finds that in addition to variables like runs scored and number of wickets taken, variables like the age of a player and the rate at which runs are scored by a batsman (strike rate) are important as well. He also finds that an interaction variable which captures the abilities of batsmen who can bowl is an important regressor, and he observes that the revenues earned by players from Australia and India are significantly higher than the rest.<sup>10</sup> A paper by Parker, Burns and Natarajan (2008) also explores the determinants of valuations and employs a reduced form model with standard OLS techniques to run their regressions. Like Karnik they find that the strike rates for both bowlers and batsmen matter and that there is a premium on being Indian. They also find that experience is positively correlated with bidding prices and that all-rounders are highly valued. An article by Borooh and Mangan (2011) looks at the bidding process in

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<sup>9</sup> Karnik, Ajit. "Valuing Cricketers Using Hedonic Price Models." *Journal of Sports Economics* 11.4 (2009): 456-69. Web.

<sup>10</sup> Karnik, Ajit. "Valuing Cricketers Using Hedonic Price Models." *Journal of Sports Economics* 11.4 (2009): 456-69. Web.

the IPL and whether some of the bids were influenced by ‘irrational exuberance’. This paper looks at the large magnitude of difference in base and final prices for cricketers like Ricky Ponting and Shane Warne tries to prove that this variation in price is due in some part to the concept of ‘irrational exuberance’. Along a similar vein they also look at the markups for individual players to find any factors that underpin player inequality. Their research demonstrates that ‘irrational exuberance’ does in fact have an impact on the prices that cricketers eventually garner during the IPL auction process.<sup>11</sup>

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<sup>11</sup> Borooah, Vani K., and John Mangan. "Mistaking Style for Substance: Investor Exuberance in the 2008 Indian Premier League Auction." *Journal of Sports Economics* 13.3 (2011): 266-87. Web.

## **Institutional Background**

### **Indian Premier League:**

The Indian Premier League is a Twenty-20 international cricket championship league in India that was created in 2008 by the Board of Control for India under the stewardship of Lalit Modi and was sanctioned by the International Cricket Council. It was modeled along the lines of the English Premier League and there were eight original franchises in the first year which were: Chennai Super Kings, Delhi Daredevils, Kings XI Punjab, Kolkata Knight Riders, Mumbai Indians, Rajasthan Royals, Royal Challengers Bangalore and the Deccan Chargers. Two additional teams were added in 2011 and they were Kochi Tuskers Kerala and Pune Warriors India. The initial auction in 2008 fetched US\$ 723.59 million. Rajasthan Royals won the first season of the IPL and was followed by Deccan Chargers, Chennai Super Kings (who won the third and fourth season) the fifth season's winners were Kolkata Knight Riders who were followed by the Mumbai Indians, who are the current defending champions.<sup>12</sup>

The league is based on a round-robin group and a knockout format. Initially the league was structured in a format where all teams played every other team twice once at their home stadium and once at the opposition team's stadium for a total of 14 games per team. At this stage of the tournament each team would get two points for winning a game and one point for a no result or tie; additionally points at the end of the group stage determined team rankings. At the end of the group stage, the top four teams play in the semifinals and the winners from the semifinals make it to the finals. However, the format changed in 2011 so that matches between some teams would be limited to a single

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<sup>12</sup> "History: Indian Premier League." *Latest Sports Updates: Live Cricket Scores*. N.p., n.d. Web. 02 Dec. 2013.

encounter. The play-off portion of the tournament now involves the four teams that finished at the top of the tables to participate in a series of knockout games that gives one team that lost its first-round game a second chance to advance to the final match<sup>13</sup>.

Teams within the IPL had to consist of 16 players on the team roster of which only eight players could be foreign; additionally of these 16 players four of them had to be under the age of 22 years. The playing team was supposed to consist of 11 players and only four of these players could be foreign.<sup>14</sup>

Not only has the Indian Premier League been a huge commercial success but it also fostered greater camaraderie and bonding between international players since a lot of them now play for the same team. The IPL also brought to light and made famous a lot of great talent that may have gone unnoticed earlier. This is in part due to the explosive nature of the T-20 format but also because the structure of the IPL greatly favored undervalued players and allowed them to showcase and harness their natural talent. This is seen more in the case of Indian players like Murali Vijay, Ravindra Jadeja, Shikhar Dhawan and Ajinkya Rahane however the IPL also propelled international players like Chris Gayle, Brendan McCullum and Kieron Pollard to fame. Additionally the Indian Premier League enabled cricketers to finally earn the kind of money that was earned by their counterparts in other professional sports<sup>15</sup> because for the first time in the history of cricket there was an auction for cricketers where their value was determined through a bidding process and hence a dollar value could be associated with each cricket player. In

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<sup>13</sup> "Indian Premier League (IPL)." *Encyclopaedia Britannica. Encyclopaedia Britannica Online Academic Edition*. Encyclopaedia Britannica Inc., 2013. Web. 02 Dec. 2013

<sup>14</sup> "Ground Rules for the IPL Auction - Hindustan Times." *Http://www.hindustantimes.com/*. N.p., n.d. Web. 02 Dec. 2013.

<sup>15</sup> "Indian Premier League (IPL)." *Encyclopaedia Britannica. Encyclopaedia Britannica Online Academic Edition*. Encyclopaedia Britannica Inc., 2013. Web. 02 Dec. 2013

the first IPL auction for example Mahendra Singh Dhoni was sold to the Chennai Super Kings for US \$1.5 million<sup>16</sup> and were he to only play international cricket for the Indian cricket team he would have never secured a revenue stream of that amount, his salary from the Board of Control of Cricket in India (BCCI) in 2013 is around \$186,000 per annum<sup>17</sup>. The Indian Premier League due to its open auction process hence became a very lucrative option for top ranked players as well.

### **IPL Auction:**

Players can be acquired by a franchise in one of five ways: in the annual auction, by signing domestic players, by signing uncapped players, through trading, or signing replacements<sup>18</sup>. In my background section I have only focused on the rules surrounding the annual auction that occurred in 2008 and have not looked at the additional changes made to the auction structure since 2008. The auction itself is designed as an open cry English auction and was conducted by a well-known, independent, professional auctioneer with each player being individually put up for bidding by the franchises. Each player has a reserve price at which the bidding for that player starts, this fee assumes the player is available to play for the entire season and is adjusted on a pro-rata basis depending on the player's availability during the season.<sup>19</sup> The highest bid is accepted as the winning bid, which became the fee that the franchise paid to the player for the season. Players in the auction were arranged in eight sets of approximately around 12 players according to their skills and capabilities as determined by the organizers. The auction is

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<sup>16</sup> "Indian Premier League (IPL)." *Encyclopaedia Britannica. Encyclopaedia Britannica Online Academic Edition*. Encyclopaedia Britannica Inc., 2013. Web. 02 Dec. 2013

<sup>17</sup> "Indian Cricketer's Salary 2013." *Paycheck.in*. N.p., n.d. Web. 02 Dec. 2013.

<sup>18</sup> "Indian Premier League." *Wikipedia*. Wikimedia Foundation, 24 Nov. 2013. Web. 02 Dec. 2013.

<sup>19</sup> Chakraborty, Soumyakanti, Anup K. Sen, and Amitava Bagchi. "Combinatorial Auctions for Player Selection in the Indian Premier League (IPL)." *Journal of Sports Economics* 00.0 (2012): 1-22. Print.

sequential, bidding started with the players in set A and went through the sets one after another however within a particular set the bidding order in which players were brought up for auction was determined by a random draw<sup>20</sup>. Appendix 4 provides a table with more details on these eight categories of players.

These bids on players were made for the first three seasons of the IPL however there still is a possibility of player transfers in the future years. Each franchise had to spend at least US\$3.3 million and their spending was capped at US\$5 million. During the bidding process the following rules regarding bidding increments had to be followed: bids up to \$100,000 faced increments of \$5,000; bids from \$100,000 to \$200,000 faced increments of \$10,000; bids from \$250,000 to \$500,000 faced increments of \$25,000 and bids in excess of \$500,000 faced increments at the auctioneer's discretion. Players who were not sold during the first round of bidding were placed in a final set and were re-presented for auction once bidding on players from all the eight sets had been completed<sup>21</sup>. The Indian Premier League also introduced the concept of 'icon players' who were players that were not part of the 2008 auction but were instead placed onto particular teams and received 15% more money than the highest paid player of that team. The icon players were players who would have been in the top draw but were given the status of 'icon players' so that they could represent their specific city teams and not be allocated to another team, hence ensuring more audience turnout.<sup>22</sup>

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<sup>20</sup> Chakraborty, Soumyakanti, Anup K. Sen, and Amitava Bagchi. "Combinatorial Auctions for Player Selection in the Indian Premier League (IPL)." *Journal of Sports Economics* 00.0 (2012): 1-22. Print.

<sup>21</sup> "Ground Rules for the IPL Auction - Hindustan Times." [Http://www.hindustantimes.com/](http://www.hindustantimes.com/). N.p., n.d. Web. 02 Dec. 2013.

<sup>22</sup> [http://www.frontier-economics.com/\\_library/publications/Frontier%20paper%20-%20IPL%20auctions.pdf](http://www.frontier-economics.com/_library/publications/Frontier%20paper%20-%20IPL%20auctions.pdf)



### **Data Collection and Methodology**

The data set includes auction prices and player statistics for professional cricketers who participated in the Indian Premier League. The years included in the data begin with the first IPL auction that occurred in February 2008 and end with the most recent auction that was conducted in February 2013. Most of the data was compiled using *ESPNcricinfo*, which is a news website devoted to cricket. All of the player statistics were acquired using *StatsGuru*, which is a database of historical players and matches from the 18<sup>th</sup> century. Various online sources were employed to find information on the player auctions because that information was less available. In addition to *ESPNcricinfo* sources like *rediff.com* and two cricket blogs, *cricketcurrent* and *islandcricket*, were also utilized in order to get complete data on the IPL auctions.

In theory, the data set might be expected to contain 478 observations, however due to incomplete information for some of the players mainly related to either their base or bidding prices during the auction 15 observations were dropped from the data set. This brought down total observations to 463 for the six year time period. Additionally, there were some players who had one or two player statistics that were missing. However, there were kept in the dataset and the missing information was filled in using the mean statistics from the rest of the sample. This was done to ensure a larger sample size and more meaningful results. Because all of the data that has been collected is numeric and quantitative in nature there is no room for any discrepancy in interpretation or gathering of the data. As mentioned before the one limitation with the data was related to missing information however, this was addressed by filling in the missing information causing the data presented to be valid, reliable and accurate.

**Table 1** presents the descriptive statistics on the variables used later in the empirical analysis. The third column documents the number of observations for each variable and for most of these variables the number of observations is equal to the total number of observations in the data set. **Table 2** documents the variation in base price through the six years of the IPL auction. The mean base price fluctuates over the six years and starts at \$206,052 in 2008 and eventually falls to \$84,167 in 2013. The minimum reserve price for all players in the auction is \$10,000 and the maximum price is \$1,350,000. As is seen the range in base price itself is pretty large. **Table 3** reports the variation in bidding price over the six years of the IPL auction. Similar to the trend in mean base price, the mean bidding price starts of a lot higher and eventually settles down at a lower value. In this table the minimum price at which a player has been sold in the IPL auction is \$20,000 and the maximum bidding price is \$2,400,000. **Graph 1** depicts the relationship between base price and bidding price over the six years of auctions. As is seen the base price is always significantly lower than the bidding price and the bidding price trails base price for the most part. Also it is important to note that there was no information available on the base prices for players in 2011 which is why the line for base price drops down to zero in 2011. **Graph 2** depicts the breakup of countries of origin for players as is seen majority of the players come from Australia, India and South Africa respectively with these three countries capturing 56% of player share. Sri Lankan players are also popular and they constitute another 12% of the entire population.

### **Empirical Model**

I employ a reduced form model to conduct my regressions and analysis. The dependent variables are either the base price (reserve price) or bidding price of the player. The independent variables are all exogenous characteristics since they are all indicators of previous performance statistics of players or they measure variables such as the age and nationality of the cricketers. Since none of my independent variables are endogenous this paper uses a reduced form model to conduct the analysis. The initial equation is modeled after a paper by Karnik (2009) which takes the following form:

$$PRICE = \beta_0 + \beta_1 RUNSR + \beta_2 WKTSR + \beta_3 AGE + \beta_4 TSR + \beta_5 IND + \beta_6 AUS + \beta_7 RUNSAR + \beta_8 YR08 + \beta_9 YR09 + \beta_{10} YR10 + \beta_{11} YR11 + \beta_{12} YR12 + \beta_{13} YR13 + \varepsilon \quad (1)$$

The independent variable is *PRICE* and as mentioned above it is either the base price or the bidding price of the player. The base price refers to the minimum reserve price at which bidding for the player starts and bidding price refers to the final price at which the player eventually gets sold in the auction. A regression of the natural log of both the base and bidding price to see if the variables explained the model better once the scale by which the prices of players were measured.

The dependent variables are *RUNSR*, *WKTSR*, *AGE*, *TSR*, *IND*, *AUS* and *RUNSAR*. *RUNSR* is one of the variables that is used to assess batting performance and it is a ratio of runs scored by a player in the T20 format to the total runs scored by all players in this format, expressed as a percentage. *WKTSR* is identical to *RUNSR* however it measures bowling performance and is hence the ratio of wickets taken by a player in the T20 format to the total wickets taken by all players, expressed as a percentage. It

would be expected that both *RUNSR* and *WKTSR* would have positive signs associated with them since the higher the number it shows the player is more skilled and should hence garner a higher wage in the market. *AGE* is the age of a player and is measured in years, since the T20 format is shorter it can be viewed to be more grueling on players since they are expected to have more stamina and make the most of every ball faced, which is why I would expect the *AGE* of the player to have a negative sign associated with it. *TSR* is the strike rate and is another indicator of batting performance. Strike rate is the number of runs scored by a batsman per 100 balls faced and similar to *RUNSR* and *WKTSR* I would expect the sign on *TSR* to be positive as well. Both *IND* and *AUS* are dummy variables that taken on values of 1 if the players are Indian or Australian respectively and 0 if not. *RUNSAR* is an interacted variable and is an interaction of *RUNSR* and a dummy variable *ALRNDR*, which takes on the value of 1 if a player is an all-rounder and 0 if not. Since *RUNSAR* is interacted with *RUNSR* I would assume for it to have a positive sign as well. The variables *YR08-YR13* were all added to the model to control for time.

Equation (2) was constructed by building off of equation (1) and employing a paper published by Frontier Economics (2008). The frontier economics paper also investigates the determinants of player valuations in the auction process. Since their paper was published in 2008 they used the data available from the initial auction that was conducted in 2008. They created binary variables for players who had never participated in a T20 match before; however since a significant amount of time has passed and more T20 matches have been played these variables were not used. Additionally two interesting variables include the number of Indian players who were 22 years of age or

under and the number of Indian players who were 23 years of age or older. However, a data limitation did not allow for this variable, as there was only one Indian player who was under the age of 22 years. As a result of these added variables the equation (1) included binary variables for the ‘icon’ players and the two top earning cricketers from every year of the auction. The second equation is listed below:

$$\begin{aligned}
 PRICE = & \beta_0 + \beta_1 RUNSR + \beta_2 WKTSR + \beta_3 AGE + \beta_4 TSR + \beta_5 IND + \beta_6 AUS + \\
 & \beta_7 RUNSAR + \beta_8 YR08 + \beta_9 YR09 + \beta_{10} YR10 + \beta_{11} YR11 + \beta_{12} YR12 + \beta_{13} YR13 + \\
 & \beta_{14} ICON + \beta_{15} TOP + \varepsilon
 \end{aligned} \tag{2}$$

In equation (2) the dependent variable stays the same as do most of the independent variables. The additions made to the independent variables are *ICON* and *TOP*. *ICON* refers to a dummy variable for the ‘icon’ players that takes on a value of 1 for icon players and 0 if otherwise. Instead of creating individual dummy variables for every ‘icon’ player I created one variable for all players together. Similarly, *TOP* is a dummy variable for the two highest paid cricketers every year and instead of creating individual dummy variables I clubbed all these players together and constructed one dummy variable.

## **Results**

**Table 4** reports the regression results for both base price and bidding price as dependent variables. Column 2 reports the results when base price is the dependent variable and column 3 reports the results when bidding price is taken as the dependent variable. The regression results presented in **Table 4** are based off of the paper on hedonic pricing and include three variables that account for batting performance, one variable that takes into account bowling performance, an age variable and two dummy variables that take into account whether a player is Indian or Australian. In this regression I include time variables from *YR03-YR13* in order to control for the effect of time on the dependent variable. The r-squared value for the regression shown in column 2 is 0.12 which suggests that 12% of the variation in base price is explained by the model. The age of a player is statistically significant at the 10% level. The coefficient on *AGE* is 2757.92, which implies that a player earns an additional \$2,758 for a 1-year increase in age. This result seems counter intuitive since one would ordinarily think that this format of cricket would favor those who are younger. The other variables that prove to be statistically significant are *YR08* and *YR09*. *YR08* is statistically significant at the 1% level and *YR09* is statistically significant at the 5% level. Column 3 reports the same regression as column 2 however here the dependent variable changed to bidding price. The results reported in this column show a decent amount of variation in comparison to those shown in the previous column. Firstly the r-squared value in column 3 is 0.25, which shows that this regression explains double the amount of variation in the dependent variable in contrast to the 12% that was explained by the regression results in column 2. Additionally one of the batting performance criteria namely *RUNSR* is statistically significant at the

1% level with a t-statistic of 3.47. The positive coefficient on *RUNSR* indicates that every percentage point increase in *RUNSR* translates to an increase in earnings for a player of \$470,638. The positive coefficient on *RUNSR* is consistent with my theory that: with an increase in player skill level the wages earned by players should also increase. Column 3 also shows that Indian players get a premium of \$404,638 on mere account of their nationality; this figure is significant at the 1% level with a t-statistic of 6.75. Column 3 seems to explain not only more of the variation in the dependent variable but it also shows us the statistical significance of some player performance criteria like *RUNSR*, which Column 2 fails to do, which is why I believe it may make more sense to take bidding price as my dependent variable in the rest of my regressions.

I also ran regressions with logs of base price and bidding price to see if there was any variation in the results. The r-squared value increases dramatically in the case of base price. It goes from 0.12 to 0.30, as we can see more than double the amount of variation is explained by the new model. Additionally the values for all the variables that were statistically significant in column 2 of **Table 4** double in this new regression except for *AGE* which only increases from 2.01 to 2.20. These results can be seen in **Table 5**. However although running the log of base price increased the statistical significance of already significant variables, this regression fails to identify any new variables of significance. Running the log of bidding price didn't seem to have any significant impact on any of the variables in the model

**Table 6** reports the results from the regression after combining the variables used in the Karnik and Frontier Economics papers. Bidding price is used as the dependent variable and not base price since analysis shows that bidding price is more sensitive to

changes in player performance statistics. The independent variables stay the same as in **Table 4** along with the inclusion of dummy variables to account for 'icon' players as well as two highest paid players from every year of the auction. The r-squared value increases pretty significantly in this regression, it goes from 0.25 to 0.41. This indicates that 41% of the variation in the bidding price is now explained by the model. With the inclusion of these new variables however the statistical significance of *RUNSR* reduces, *RUNSR* is now significant at the 5% level. Looking at the coefficient on *RUNSR* especially one sees that the inclusion of the new variable causes the coefficient to go from 470,638 to \$334,990 which means that a 1 percentage point increase now causes the worth of a cricketer to fall by \$135,378 in comparison to the first set of regressions. The India variable now becomes statistically significant and implies that Indian players earn \$320,069 more than players from other countries all other things being equal. The results from **Table 6** also show us that the dummy variables for both 'icon' players and the top two earning players from every year of the auction are both statistically significant at the 1% level with t-statistic values of 3.48 and 8.35 respectively. Icon players earn \$664,946 more than the other players and the top 12 earning players on average earn \$706,062 more than the rest of the players who were put up for auction. By controlling for both 'icon' players and the top earners not only does the r-squared value of the model increase but some player statistics also become statistically significant and one can see the impact that specific players may have on prices during the auction process.

While observing the results from **Tables 4-6** I noticed that none of the bowling statistics were statistically significant. Therefore, I ran a regression on both the base and bidding price of players on the following dummy variables: *batsman*, *bowler*, *all-rounder*



and *wicketkeeperbatsman*. **Table 7** shows the results for both base price and bidding price as dependent variables. Column 2 shows the results with respect to base price and in this regression all variables are statistically significant and have positive signs associated with them. These results are interesting when you compare them to the results in column 3 which runs the same regression but for bidding price. In column 3, both the *bowler* and *wicketkeeperbatsman* variables lose their statistical significance which shows me that bowlers don't seem to be valued as highly as batsmen; this finding is consistent with my other results as well. Looking at the differences in the coefficients between batsmen and bowlers in the two regressions also leads one to observe an interesting phenomenon. When base price is the dependent variable the coefficient on batsmen is 73,461 and it is 55,276 for bowlers; these numbers are in stark contrast to the numbers that are generated when bidding price is the dependent variable. The coefficient on batsmen in column 3 is 264,440 whereas it is 74,186 for bowlers. Batsmen earn a lot more than bowlers in this second set of regressions which leads me to believe that batsmen are valued a lot more than bowlers and this finding is once again consistent with my previous findings.

I also ran regressions after inserting variables that I thought were logical to add based on my research through the semester either by reading articles and papers online or through my conversations with avid cricket fans. I added six additional variables to my model, none of which turned out to be statistically significant. To look at whether macroeconomic factors like labor market conditions had any effect on the wages earned by players I created dummy variables for the teams from which players were being auctioned and whether those teams had won or lost in the previous years. Inclusion of these dummy variables did not make a significant difference to my model either; this

result also seems slightly counter intuitive since one would expect the laws of demand and supply to work in an open auction. Another regression that I ran to assess the impact of increased demand and supply on player auction prices was by creating dummy variables for the two new teams that were added in 2011, the results generated by this regression doesn't shed any light on the factors that affect player auction prices either. I also ran regressions on players after dividing them into the eight categories into which they had been assigned on the basis of their reserve prices; this further categorization also seems to have no effect in explaining the regression results in a clearer manner.

## **Conclusion**

This paper examines and tries to estimate the value of various characteristics that go into defining a cricketer. Here a cricketer is defined by the price he gets sold at during the IPL auction process. The empirical model suggests that there are some performance criteria that players can improve in order to be more highly valued. The model finds that these criteria are related to batting statistics and lays special emphasis on them and doesn't value any bowling performance statistics. In addition to these variables, it appears that Indian players capture a premium in earnings relative to players from other countries. The inclusion of 'icon' players and the top two highest paid players for every year of the auction is also significant.

The age of a player is also an important factor to consider as it is statistically significant. The evidence uncovered in this paper suggests that there is a positive relationship between the age of a player and his earnings however this may be a limitation of my data and analysis since past research has shown that the relationship between the age of a player and his earnings especially in the T20 format should be negative. Another limitation of the study is that while the model employed does explain some amount of variation seen in the results it also leaves a lot to be desired. This suggests to me that cricket may be in need of some better performance criteria that are able to explain variation in player prices; cricket may be in need of its own Moneyball effect.

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## Appendices

### Appendix 1: Descriptive Statistics

**Table 1**

This table presents the summary statistics for both the dependent and independent variables that were employed in my regressions. The dependent variables are base price and bidding price and the rest of the variables are independent variables. Since IND, AUS, ICON and TOP are dummy variables they take on a minimum value of 0 and a maximum value of 1

Variable Name	Definition <sup>1</sup>	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Baseprice	Minimum price at which bidding for a player starts at	323	141,981	144,343	10,000	1,350,000
Biddingprice	Price at which player eventually gets sold	316	491,567	456,349	20,000	2,400,000
RUNSR	Ratio of runs scored by a player to the total runs scored by all players	501	0.200	0.214	0	1.265383
WKTSR	Ratio of wickets taken by a player to the total wickets taken by all players	501	0.200	0.142	0	1.148
AGE	Age of a player	477	30.959	5.803	20	44
TSR	Number of runs scored per 100 balls faced	501	116.601	35.132	0	400
IND	A dummy variable taking a value 1 if the player is Indian; 0 otherwise	501	0.184	0.388	0	1
AUS	A dummy variable taking a value 1 if the player is Australian; 0 otherwise	501	0.253	0.435	0	1
RUNSAR	Interacted variable between RUNSR and the dummy variable "allrounder"	501	0.045	0.140	0	1
ICON	A dummy variable for the 'icon' players	501	0.008	0.089	0	1
TOP	A dummy variable for the two highest paid cricketers every IPL	501	0.044	0.205	0	1

<sup>1</sup> Karnik, Ajit. "Valuing Cricketers Using Hedonic Price Models." *Journal of Sports Economics* 11.4 (2009): 456-69. Web.

**Table 2**

This table reports summary statistics for the variation in base price across the years

Year	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
2008	76	206,052.6	70,674.45	100,000	450,000
2009	80	163,000	241,555.6	45,000	1,350,000
2010	62	84,516.13	54,522.59	10,000	250,000
2011	0	-	-	-	-
2012	69	128,840.6	104,523.2	20,000	500,000
2013	36	84,166.67	57,588.44	20,000	200,000

**Table 3**

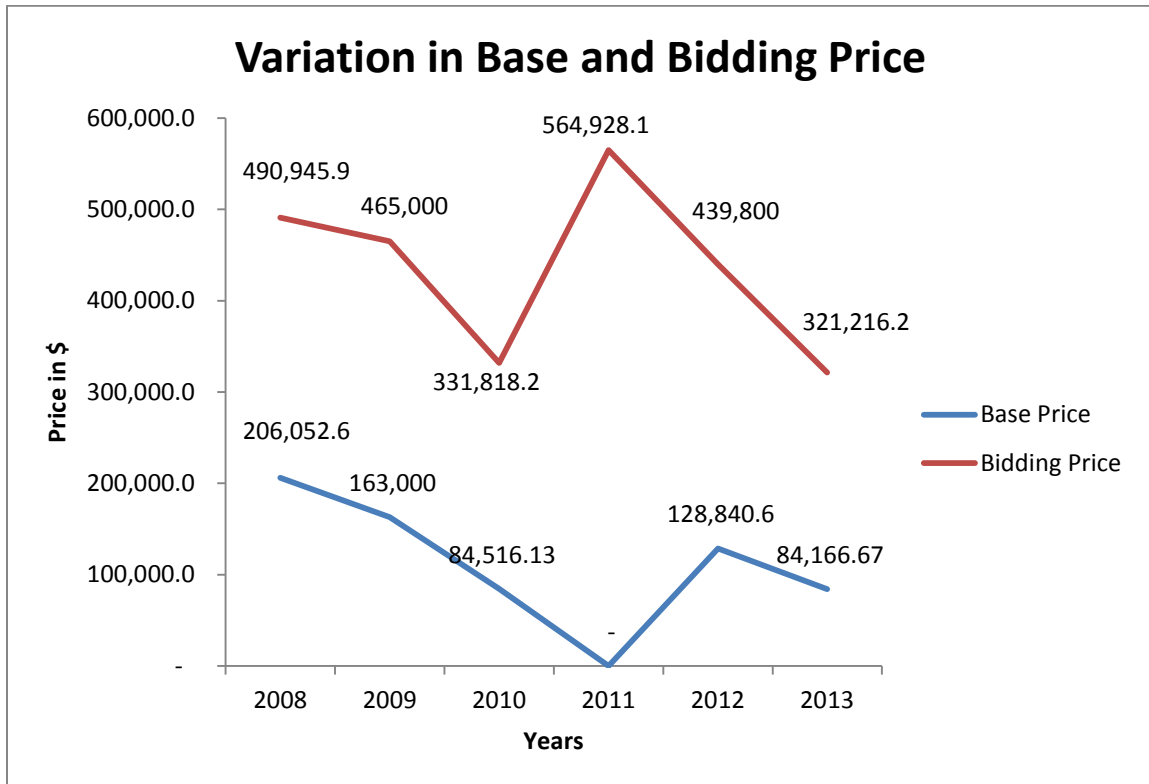
This table reports summary statistics for the variation in bidding price across the years

Year	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
2008	74	490,945.9	286,420.6	110,000	1,500,000
2009	30	465,000	491,738.6	50,000	1,550,000
2010	11	331,818.2	307,044.6	50,000	750,000
2011	139	564,928.1	548,226.7	20,000	2,400,000
2012	25	439,800	479,905.5	50,000	2,000,000
2013	37	321,216.2	261,513.8	20,000	1,000,000



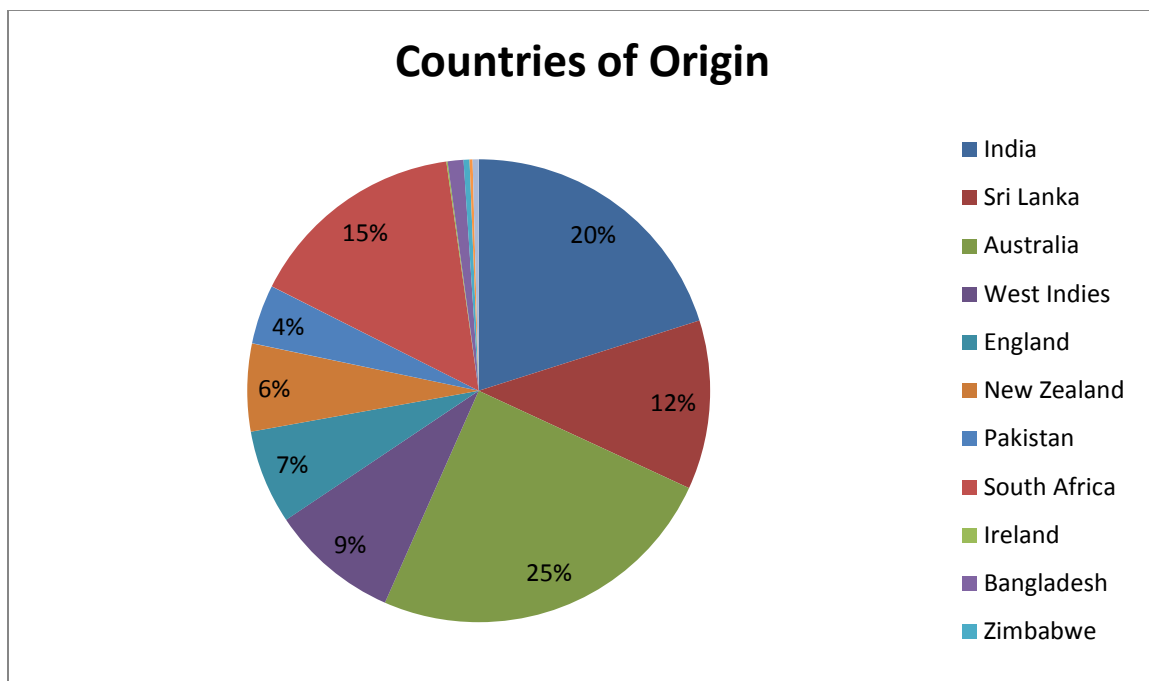
**Graph 1**

This graph depicts the variation in base price and bidding price across the six years of the IPL auction and it also highlights the relationship between base price and bidding price



**Graph 2**

This graph represents the breakup of players depending on their country of origin



## Appendix 2: Regression Tables

**Table 4**

This table reports the regressions for both base price and bidding price as dependent variables. Column 2 reports the results when base price is the dependent variable and column 3 reports the results when bidding price is taken as the dependent variable. The independent variables are RUNSR, WKTSR, AGE, TSR, IND, AUS, RUNSAR, YR08, YR09, YR10, YR11, YR12 and YR13. Heteroskedasticity-robust standard errors are reported in parentheses. \*\*\*, \*\* and \* indicate significance at 1%, 5%, and 10% levels respectively.

Variable	baseprice	biddingprice
RUNSR	37992.3 (53715.2)	470638.5*** (135665.3)
WKTSR	37348.1 (81850.2)	99134 (159801.8)
AGE	2757.9* (1371.6)	7634.3 (4839.3)
TSR	-114 (265.8)	1343.4 (799.0)
IND	-3008.3 (28790.6)	404638.4*** (59968.1)
AUS	-15754.3 (19933.9)	5620.9 (62115.1)
RUNSAR	61573.5 (106811.6)	149991.9 (168248.1)
YR08	112517.9*** (31289.9)	-7834.9 (97859.2)
YR09	86672.4** (29003.9)	136919.3 (113546.8)
YR10	-5197.4 (30320.5)	-39605.6 (147017.4)
YR11	0 .	8586.9 (90583.0)
YR12	47650.1 (29321.7)	0 .
YR13	0 .	-82812.6 (106203.4)
_cons	3358.5 (59079.3)	-143666.4 (187379.4)
Obs	310	302

**Table 5**

This table reports the regressions when the log of base price is taken as the dependent variable. The independent variables are RUNSR, WKTSR, AGE, TSR, IND, AUS, RUNSAR, YR08, YR09, YR10, YR11, YR12 and YR13. Heteroskedasticity-robust standard errors are reported in parentheses.\*\*\*,\*\* and \* indicate significance at 1%, 5%, and 10% levels respectively.

Variable	logbaseprice
RUNSR	0.379 (0.2)
WKTSR	0.566 (0.4)
AGE	0.0140* (0.0)
TSR	-0.00135 (0.0)
IND	0.0442 (0.1)
AUS	-0.0545 (0.1)
RUNSAR	0.356 (0.5)
YR08	1.065*** (0.1)
YR09	0.568*** (0.1)
YR10	0.0761 (0.1)
YR11	0 (.)
YR12	0.443** (0.1)
YR13	0 (.)
_cons	10.64*** (0.3)
Obs	310

**Table 6**

This table reports the regressions when bidding price is taken as the dependent variable. The independent variables are RUNSR, WKTSR, AGE, TSR, IND, AUS, RUNSAR, ICON, TOP, YR08, YR09, YR10, YR11, YR12 and YR13. Heteroskedasticity-robust standard errors are reported in parentheses.\*\*\*,\*\* and \* indicate significance at 1%, 5%, and 10% levels respectively.

Variable	biddingprice
RUNSR	334989.7** (121736.3)
WKTSR	22273 (142656.3)
AGE	5970.9 (4373.2)
TSR	802.1 (712.8)
IND	320068.8*** (54431.5)
AUS	14369.5 (55281.3)
RUNSAR	120224.1 (150562.0)
ICON	664946.0*** (191014.1)
TOP	706061.5*** (84606.1)
YR08	-17316.2 (87100.5)
YR09	49026.9 (101442.1)
YR10	-153722.3 (131331.9)
YR11	10357.4 (80660.0)
YR12	0 (.)
YR13	-99525.9 (94456.2)
_cons	-3525.2 (169253.4)
Obs	302

**Table 7**

This table reports the regressions for both base price and bidding price as dependent variables. Column 2 reports the results when base price is the dependent variable and column 3 reports the results when bidding price is taken as the dependent variable. The independent variables here are all dummy variables that are used as indicators of a playing role. The independent variables are as follows: batsmen, bowler, allrounder and wicketkeeperbatsman. Heteroskedasticity-robust standard errors are reported in parentheses.\*\*\*,\*\* and \* indicate significance at 1%, 5%, and 10% levels respectively.

Variable	baseprice	biddingprice
batsmen	73460.9*** (21016.0)	264440.8** (82099.5)
bowler	55276.4* (21938.7)	74185.5 (79888.7)
allrounder	57918.9* (23544.1)	212761.4* (84624.6)
wicketkeep~n	122984.7** (43227.4)	175785.2 (117787.1)
_cons	95765.3*** (14277.5)	341595.7*** (65456.5)
Obs	323	316

### **Appendix 3: Overview on Cricket**

Cricket is a bat and ball game, which consists of two teams (a batting team and a bowling/fielding team) with 11 players on each team. It was developed in England in the Middle Ages and while the game has undergone many modifications its basic premise, it still remains roughly the same and is similar to baseball. Cricket is played on a field with a flat rectangular strip generally at its center, known as the 'pitch'. At either end of the pitch there are three wooden sticks known as 'stumps' or 'wickets'. During a game of cricket, the team that is bowling has all 11 players on the field while the batting team only has two players up at the wickets simultaneously. The batsman are on opposite sides of the pitch with one of them standing in front of the stumps and facing the balls delivered to him from a member of the opposing team. The main aim of the batsman is to score the maximum number of runs for their team without getting out. Batsman score runs by striking the ball and running between wickets while the bowling side recovers and returns the ball. Additionally batsman can hit either four's or six's. These are achieved when the ball reaches the boundary of the field either with or without a bounce. Once a batsman gets out he is replaced by the next member of his team, this process continues on until 10 of the 11 players of the batting team are out (or the inning is over). Conversely, it is the main aim of the bowling team to restrict the number of runs scored by the batting team and try to get all their players out in the shortest period of time possible. A bowler bowls six balls consecutively. This sequence of six balls is called an 'over'. After a particular over the bowler can choose to keep on bowling or he can handover the reigns to another bowler from the fielding side. There are a number of ways in which bowlers can get batsmen out. These include: being 'bowled', being 'leg before

wicket', being 'caught' or being 'run out'. A batsman is 'bowled' out when he accidentally allows the ball delivered by the bowler to strike down one of the stumps; he is subject to a 'leg before wicket' when he uses his body to prevent the ball from striking the wicket; he is 'caught' when a member of the fielding team catches a ball that has been struck by the batsman without it having bounced at least once; and he is 'run out' when he allows the stumps to be hit while running between the wickets that are on opposite ends of the pitch.

Currently there are three forms of cricket that are played: test matches, one day matches and matches in a Twenty-20 format. Test matches were the first cricket match format that was played and in the recent past these matches popularity has been waning. In this format each team is restricted to a particular number of 'innings' generally between one and two and the team that wins is determined by which team scores the highest number of runs across their innings. The duration of these two innings test matches is between three to five days and if no team wins the match in this time period then the match is considered a draw. One day matches are also known as 'limited over' matches and these were introduced to the sport in 1963. In these matches each team only has one inning and each inning is restricted to a certain number of overs that the fielding side can bowl, which is always 50 overs. The batting team's innings finishes either when the 50 overs have been bowled or 10 of the 11 batsmen have been dismissed, whichever comes first. A typical one day match lasts for around six to seven hours. The winner of the game in this format is the team that scores the most runs in their innings. Twenty-20 also known as T-20 is a new format of the game that was created in the summer of 2003 in Great Britain. It is the shortest format of cricket played and each inning consists of



only 20 overs. Since this format is considerably shorter the average length of a game is between two and a half to three hours. The primary difference between these three formats of cricket is the duration of the game since the rest of the aspects of the game are similar irrespective of which format of the sport is being played.<sup>23</sup>

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<sup>23</sup> Andreff, Wladimir, and Stefan Szymanski. *Handbook on the Economics of Sport*. Cheltenham, UK: Edward Elgar, 2006. Print.

## Appendix 4

Table 1: Basic Statistics of the IPL Auction

Category		Base Price (US\$)	Bidding Price (US\$)	Premium (US\$)
A=1;	Range	250,000- 450,000	425,000- 1,500,000	0-1,100,000
no of players =6	Average	316,667	691,667	375,000
B=2;	Range	250,000-350,000	350,000-975,000	0-725,000
no of players =5	Average	270,000	675,000	405,000
C=3;	Range	175,000-325,000	350,000-1,350,000	75,000-1,100,000
no of players =8	Average	246,875	671,875	425,000
D=4;	Range	200,000-350,000	225,000-900,000	0-650,000
no of players= 11	Average	247,727	564,091	316,364
E=5;	Range	125,000-200,000	125,000-525,000	0-325,000
no of players = 6	Average	170,833	312,500	141,667
F=6;	Range	100,000-200,000	175,000-925,000	0-725,000
no of players=10	Average	157,500	430,000	273,000
G=7;	Range	100,000-225,000	100,000-800,000	0-600,000
no of players= 15	Average	160,000	438,333	278,333
H= 8;	Range	100,000-225,000	110,000-950,000	0-800,000
no of players= 14	Average	164,286	350,000	186,071

\* Karnik, Ajit. "Valuing Cricketers Using Hedonic Price Models." *Journal of Sports*

*Economics* 11.4 (2009): 456-69. Web.