RESEARCH

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Player Pricing and Valuation of Cricketing Attributes: Exploring the IPL Twenty20 Vision

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Executive Summary

The Indian Premier League (IPL), a professional Twenty20 cricket tournament, was launched in April 2008 by the Board of Control for Cricket in India (BCCI). Modelled along the lines of the National Basketball Association (NBA) of USA and the English Premier League of England, the IPL franchisee rights of the participating eight teams were sold through competitive bidding. Importantly, the franchisee team owners bid for the services of cricketers for a total of US$ 42 million. However, not much is known about the process of valuation of the cricketers' services. Given the data on final bid prices, cricketing attributes of the players, and other relevant information, this paper tries to understand which attributes seem to be important and what could be their relative valuations. It employs the bid and offer curve concept of hedonic price analysis and econometrically establish a relation between IPL-2008 final bid prices and the player attributes. Following are the major observations:

- Non-cricketing attributes such as fame and popularity are rewarded with a very high premium; the premium depends upon the associated glamour or the controversy surrounding the player.
- Franchisee fixed effects in the final bid price of the players are significant for two teams – Kings XI Punjab and Mumbai Indians.
- On an average, Indian players command a premium of about US$ 2,57,557.
- Among the cricketing attributes, batting average in Twenty20, batting strike rate in One Day Internationals, and number of half-centuries, stumpings, and wickets taken in all forms of the game are important determinants of the final bid price.
- Increase in the batting average for Twenty20 matches by a run raises the final bid price by US$ 5,430.
- Increase in the One Day International batting strike rate by a run raises the final bid price by US$ 4,709.
- An additional half-century, an additional stumping, and an additional wicket taken in any form of the game raises the final bid price by US$ 2,762, US$ 2,767, and US$ 335 respectively.
- *Ceteris paribus*, a player loses out US$ 28,518 in the final bid price by being older by a year relative to other players.
- No significant premium is attached to assigning an ICON status to a player.

With the commencement of the second IPL season, it is hoped that the analysis carried out in this study would facilitate a better understanding of the player price formation and underscore the predictive value of such data-driven analysis. The study can also be used to create a payment benchmark in other forms of the game such as Test Cricket, and could be extended to other sports as well.

KEY WORDS

Indian Premier League

IPL Tournament

Twenty20 Cricket

Hedonic Price Analysis

Cricketing and Non-cricketing Attributes

Auction Price of Cricketers

Bid and Offer Curves

The Indian Premier League (IPL), a tournament modelled on the lines of the National Basketball Association (NBA) of USA and the English Premier League of England, made its debut in India in April 2008. IPL is a professional Twenty20 cricket league, launched by the Board of Control for Cricket in India (BCCI) and has the backing of the International Cricket Council (ICC). The tournament is played among eight teams, 20 overs being bowled by each team in any given match. The eight teams represent eight different cities of India, the franchisee rights of which are auctioned-off to successful bidders for ten years. The successful bidders include industrial houses such as Reliance Industries and United Breweries, which own the teams—Mumbai Indians and Royal Challengers Bangalore respectively.

The first round of the tournament is played on a double round-robin basis, where each team plays the other seven teams at home and away. The top four teams play the two semi-finals, followed by a final at the end. This makes for 56 league matches, two semi-finals, and a final match. Thus, the tournament involves a total of 59 matches of 20-20 overs each, to be played among eight teams. While eleven players take the field in a match, each team maintains sixteen players. Five of the teams have a designated Icon player, who is paid an amount 15 per cent higher than the highest paid player in that team. The idea of having Icon players stems from the belief that by representing their respective regions, they would be able to generate a keen interest in the team and for the tournament. Virender Sehwag is the Icon player for Delhi, Sourav Ganguly for Kolkata, Rahul Dravid for Bangalore, Yuvraj Singh for Punjab, and Sachin Tendulkar for Mumbai. For every team, there is a catchment area defined as per the geographical location of the city they represent. Each team must have at least four players from its respective catchment area and four Under-22 players. The players from the catchment areas could be an icon player, a Ranji Trophy player, or an Under-22 player. Each team can buy a maximum of eight overseas players; however, only four of them would take the field in a match.

Given the above ground rules, the franchisee owners formed their teams for IPL 2008 by participating in an auction of the cricket players. The prices received by the players varied quite significantly. For example, among the highly prized cricketers, Mahendra Singh Dhoni topped the list with a price of US$ 1.5 million, i.e., about Rs. six crores then, while at the other end, players like Dominic Thornely received US$ 25,000, or Rs. ten lakh then. The details of the teams, players, and their final bid prices are given in Appendix 1. The total auction payment to the players exceeded US$ 42 million. This trend involving such sky-high payments to IPL players poses the following questions: How are the bidding prices determined? What cricketing attributes and other factors are implicitly decisive in the final bid prices? And, among these attributes, which are valued more than the others? With the commencement of the second IPL season in April 2009, the IPL is here to stay, and, therefore, these questions become quite pertinent.

LITERATURE REVIEW AND METHODOLOGY

There have been several studies on players' compensation in various sports. For example, Estenson (1994), MacDonald and Reynolds (1994), and Bennett and Flueck (1983) studied player compensation in baseball. Similarly, Dobson and Goddard (1998) and Kahn (1992) considered compensation issues in football. There are also related studies in ice-hockey (Jones and Walsh, 1988) and basketball (Berri, 1999, and Hausman and Leonard, 1997). In cricket, there are a few studies which deal with the scheduling of cricket matches (Armstrong and Willis, 1993; Wright, 1994; and Willis and Terrill, 1994). Barr and Kantor (2004) sought to determine the important characteristics for a batsman in one-day cricket. However, we have not come across any study that links compensation to player attributes. Also, none of the studies use hedonic price analysis, which we describe now, as a unique way of measuring valuation of (cricketing) attributes leading to the formation of player price.

Hedonic price analysis is based on the hypothesis that a good/service can be treated as a collection of attributes that differentiates it from other goods/services. Waugh (1928) propounded this concept based on his observation of different prices for different lots of vegetables. Waugh sought to identify the quality traits influencing daily market prices. Later, Rosen (1974) based his model of product differentiation on the hypothesis that goods are valued for their utility generating attributes. According to him, while making a purchase decision, consumers evaluate product quality attributes, and pay the sum of implicit prices for each quality attribute, which is reflected in the observed market price. Hence, price of a product is nothing but the summation of the shadow prices of all quality attributes.

Shapiro (1983) presented a theoretical framework to examine the halo effect on prices. Developing an equilibrium price-quality schedule for high-quality products, under the assumption of competitive markets and imperfect information, he showed that reputation facilitates a price premium; hence, reputation building can be considered as an investment good. Weemaes and Riethmuller (2001) studied the role of quality attributes on preferences for fruit juices. The study involved market valuation of various attributes of fruit juice. It did not consider consumers' preferences *per se* but generated quality attributes from the product label. The study revealed that consumers paid a premium for nutrition, convenience, and information. In a similar study on tea, Deodhar and Intodia (2004) showed that colour and aroma were the two important attributes of a prepared tea.

Extending the analogy to cricket, a cricket player is valued for his on-the-field (and perhaps, off-the-field) performance. We propose that a cricket player sells his cricketing services for the IPL tournament. The franchisee team owners bid for the players' services, for they would like to maximize their utility (chances of winning and maximizing profit), and player performance is an important argument of their utility function. In equilibrium, the final bid price of a player must be a function of the valuation of winning attributes of a player. Therefore, given the data on values of various attributes of the cricket players and their final bid prices, one can estimate the following hedonic price equation econometrically,

$$(1) \qquad P_i = g\,(\,z_{i1}, \ldots, z_{ij}, \ldots, z_{in}),$$

where P_i is the final bid price paid to a cricketer i for the IPL tournament and z_{ij} is the value of the attribute j of the cricket player i. The hedonic price equation, in this context, is a locus of equilibrium final bid prices and player attributes, where buyers (team owners) and sellers (cricket players) participate in an auction. Derivation of the hedonic price equation is reported in Appendix 2.

HYPOTHESES, DATA, AND REGRESSION RESULTS

Based on the hedonic price analysis discussed earlier, we hypothesize that the equilibrium final bid price of an IPL cricket player, as given in equation (1), is nothing but the sum total of the shadow prices of his attributes. IPL cricket being both a sport and a source of entertainment, we postulate that both cricketing and non-cricketing attributes must be contributing to the final bid price of the players. From the team owners' perspective, winning and crowd-pulling abilities of a player, are very crucial for IPL. Higher the winnability and crowd pulling attributes of the players, higher will be the revenue earned from sale of tickets, broadcasting rights, sports merchandize, memorabilia, and advertisements.

Considering IPL as a business proposition in an entertainment industry framework, we hypothesize that non-cricketing attributes are as much important for drawing crowds as are the cricketing attributes. Such non-cricketing attributes can be incorporated to estimate equation (1) by creating dummy variables. As mentioned earlier, apart from the cricketing abilities, IPL authorities seemed to recognize the regional popularity of the players by choosing five players in the auction as Icon players. These players are likely to be more valuable to the teams for their regional popularity. Glamour and controversies have also been part of the game and team owners would like to cash-in on this aspect as well. For example, media has associated charismatic players like Mahendra Singh Dhoni and Yuvraj Singh with film stars and they are quite popular among the youth. Similarly, just prior to the first IPL auction, Andrew Symonds and Harbhajan Singh got embroiled in a racial controversy and were perceived to attract big crowds.

Moreover, as the name itself suggests, IPL is mainly targeted at the Indian spectators for whom cricket is almost a religion. They certainly would like to see Indian players on the field. Therefore, *ceteris paribus*, team owners might have placed a premium on the Indian players over the foreign players. We also wondered if there were any franchisee fixed effects on the final bid price, i.e., whether or not any franchisee had paid more to its players on an average as compared to the payment made to the players of other franchisees. We capture all the above-mentioned non-cricketing attributes by introducing dummy variables to estimate equation (1) econometrically. The description of the dummy variables is given in Table 2.

While non-cricketing attributes matter in IPL, the success of IPL depends mainly on the core competencies of the cricket players, i.e., their cricketing attributes. Variables that capture the batting, bowling, agility, and stumping performances of cricket players must contribute to the players' final bid price. Data on final bid prices and values of cricketing attributes of players are readily

available for IPL 2008. The data sources include the official website of IPL and two other websites, Cricinfo and Wikipedia. The bidding process involved 99 players but data is available only for 96 players (Table 1).[1] While we consider the final bidding price as the dependent variable, there is a wealth of data available on the cricketing attributes of IPL players hypothesized above. We have data from various forms of the game — Test matches, One Day Internationals (ODIs), Twenty20 matches, and First class cricket.

Among others, the variables available are runs scored, batting average, batting strike rate, number of centuries, number of half-centuries, player's age, number of catches taken, number of stumpings, number of wickets taken, bowling average, bowling economy rate, and bowling strike rate.

The relevant variables are drawn from observations on skills that are considered important for Twenty20 form of the game. For example, in this shorter version of the game, no one is likely to make centuries. However, a player contributing many half-centuries, and having high strike rate and batting average would be an asset for the team. While IPL is a batsman's game, a wicket-taking bowler could put a lot of pressure on the opposition, and hence, he would be considered quite useful. In test cricket, being aged is not necessarily a drawback; however, in a quick-fire game of IPL, physical agility is important. Therefore, players' age would also be an important factor. To paraphrase Patterson (2000), Kennedy, and Gujarati (2003), model specification has to have a good combination of economic theory and empirical data, where the estimated variable coefficients have the right signs and are statistically significant, the equation has a reasonably high (adjusted) *R*-square and maintains parsimony, and there are sufficient degrees of freedom. Based on such guidelines, the variables chosen for estimating equation (1) and their description is reported in Table 2, and descriptive statistics of the non-dummy variables is given in Table 3. We estimated various Box-Cox transformations of the regression equation including double log, lin-log, and log-lin. Linear equation offered the best goodness of fit in terms of *R*-square, adjusted *R*-square, correct signs of the coefficients, *t*-statistics, and *F*-statistics. The exact specification of the regression is given below in Equation (2).

$$(2)\quad P = \alpha + \beta_1 ICON + \beta_2 GLAM + \beta_3 CNTRVRSY + \beta_{4j} FRANCHISEE_j + \beta_{5j} COUNTRY_j + \beta_6 AGE + \beta_7 BA20 + \beta_8 SRODI + \beta_9 FIFTY + \beta_{10} STMPNGS + \beta_{11} WICKETS + \varepsilon$$

Table 1: No. of Players from Different Countries for IPL 2008

Country	No. of Players	Country	No. of Players
India	31	Australia	18
South Africa	12	Sri Lanka	11
New Zealand	7	Bangladesh	1
Zimbabwe	1	Pakistan	11
West Indies	3	England	1

Table 2: Description of Variables

Variable	Description
P	Final bid price of a player in US dollars
ICON	Dummy variable with value 1 for five Icon players and 0 for others. The Icon players are: Yuvraj Singh, Punjab; Sourav Ganguly, Kolkata; Rahul Dravid, Bangalore; Virender Sehwag, Delhi; and Sachin Tendulkar, Mumbai
GLAM	Dummy variable with value 1 for the players having association with film stars. The players are Mahendra Singh Dhoni, Chennai and Yuvraj Singh, Punjab
CNTRVRSY	Dummy variable with value 1 for the players involved in racial controversy. The players are Harbhajan Singh, Mumbai and Andrew Symonds, Hyderabad
$FRANCHISEE_j$	Franchisee dummy for each team. Base dummy is Rajasthan Royals, Jaipur (RRJ). j = 1 to 7 for franchisees teams Chennai Super Kings (CSK), Delhi Daredevils (DD), Kings XI Punjab (KP), Royal Challengers Bangalore (RCB), Mumbai Indians (MI), Deccan Chargers Hyderabad (DCH), and Kolkata Knight Riders (KKR)
$COUNTRY_j$	Country dummy for player's nationality. Base dummy is Pakistan. j = 1 to 6 for countries India, Australia, New Zealand, Sri Lanka, South Africa, and Others. Others include Bangladesh, England, Zimbabwe, and West Indies with 3 or less players in IPL-2008
AGE	Age of the player in completed years
BA20	Batting average in all Twenty20 international matches
SRODI	Batting strike-rate in all one-day international matches
FIFTY	Total number of half-centuries in all four forms of cricket
STMPNGS	Total number of stumpings in all four forms of cricket
WICKETS	Total number of wickets taken in all four forms of cricket

1 However, complete data on all relevant cricketing attributes were available only for 64 players. Thus we could work only with 64 observations for the present study.

Table 3: Descriptive Statistics of Non-Dummy Variables (*N*=64)

Variable	Maximum	Minimum	Mean	Std. Dev.
P	1,500,000	50,000	466699	335420
AGE	37	20	28.69	4.15
BA20	96	0	21.67	16.05
SRODI	132.29	36.17	79.18	14.72
FIFTY	233	0	60.31	57.67
STMPNGS	147	0	9.44	27.73
WICKETS	1,784	0	287.77	399.32

As reported in Table 4, *R*-Square and adjusted *R*-Square take a value of 0.77 and 0.65, and the *F*-statistics is 6.25 at 0.001 significance level. All non-dummy variables and key dummy variables are statistically significant at 0.05 level (two-tail test). These statistics indicate that the regression fit is quite robust.

Table 4: Regression Results

Variables	Parameter	Estimate	*t*-values*
Intercept	α	221334	0.62
ICON	β_1	52186	0.32
GLAM	β_2	453005	2.50
CNTRVRSY	β_3	384718	2.38
$FRANCHISEE_j$			
CSK	β_{41}	190391	1.43
DD	β_{42}	205144	1.68
KP	β_{43}	236486	1.89
RCB	β_{44}	87437	0.74
MI	β_{45}	260570	1.90
DCH	β_{46}	125726	1.00
KKR	β_{47}	160183	1.34
$COUNTRY_j$			
India	β_{51}	257557	2.34
Australia	β_{52}	119826	1.11
New Zealand	β_{53}	74962	0.68
Sri Lanka	β_{54}	-5968	-0.05
South Africa	β_{55}	112204	1.05
Other	β_{56}	-70266	0.63
AGE	β_6	-28518	-2.41
BA20	β_7	5430	2.83
SRODI	β_8	4709	2.33
FIFTY	β_9	2762	3.86
STMPNGS	β_{10}	2767	2.65
WICKETS	β_{11}	335	3.68

* All coefficients with *t*-stat of 2 or more are significant at 5% two-tail test. *R*-square = 0.77, Adj. *R*-square = 0.65, *F*-stat = 6.25 at significance level 0.001. *N* = 64 observations.

INTERPRETATION OF RESULTS AND CONCLUDING COMMENTS

The coefficient of the variable ICON is highly insignificant. Thus, *ceteris paribus*, it appears that Sachin Tendulkar, Saurav Ganguly, Rahul Dravid, Virender Sehwag, and Yuvraj Singh do not earn any premium for their regional iconic popularity. The high final bid prices received by these players may truly reflect a compensation for their superior cricketing attributes. However, the statistically significant GLAM and CNTRVRSY variables suggest that Yuvraj Singh and Mahendra Singh Dhoni get a premium of about $4,53,000, and, Andrew Symonds and Harbhajan Singh receive a premium of $3,84,718. These high premiums, over and above the compensation for their cricketing attributes, seem to be a reflection of their ability to draw huge crowds nationally due to their charismatic association with film stars and the racial controversies surrounding them, respectively.

Does an Indian player command a premium over foreign players? The answer is, Yes. We consider $COUNTRY_j$ variables with Pakistan as the base dummy. As reported in Table 4, coefficients of all the country dummies are highly statistically insignificant except for that of India. On an average, therefore, it appears that Indian players receive a premium of more than $2,50,000. Are there any franchisee fixed effects on the final bid price? Except for Mumbai Indians and Kings XI Punjab, no such statistically significant effects are observed. The team owners of Mumbai Indians and Kings XI Punjab seem to be better pay-masters offering on an average a premium of $2,60,570 and $2,36,486 respectively at a statistical significance level of 0.06.

The variables relating to the cricketing attributes of the players have the right signs and are highly significant. An increase in Twenty20 batting average (BA20) by one run fetches an additional US$ 5,430 to the cricketer's final bidding price. Similarly, the number of half-centuries (FIFTY) in all forms of the game is also found to be rewarding with US$ 2,761 for every additional half-century. Moreover, a one-point increase in the strike rate in One Day International (ODI) matches seems to fetch US$ 4,709. This only goes to show that substantive quick runs are more sought after and rewarded in an IPL Twenty20 match. One would also expect age to play a role in the final bid prices. Regular and prolonged participation in

games as well as biological aging is likely to make a person less agile and fit. This does get reflected in the final bid price with the coefficient for age being negative and statistically significant. On an average, a player loses out US$ 28,518 for getting older by one more year. Moreover, every additional wicket taken (WICKETS) earns a player US$ 335 and an additional stumping contributes about US$ 2,766.

Among the existing sports researches in general and researches on cricket in particular, this paper is the first attempt to provide an objective valuation of cricketers based on the valuation of their cricketing and non-cricketing attributes as perceived by the business of cricket. With the second IPL season having commenced in April 2009, it is clear that IPL is here to stay. We hope that this kind of research would facilitate a better understanding of the player price formation and underscore the predictive value of such data-driven analysis. With this paper, we hope to open a new innings in sports-related research, wherein players' attributes are used to objectively evaluate their market value. The analysis and methodology need not be relevant to IPL alone. It can be used to create payment benchmarks in other forms of the game such as Test Cricket and could be extended to other sports as well.

Appendix 1: Teams, Players, and Prices

Team	Player	Final Bid Price (US$)
Chennai Super Kings	Matthew Hayden	375,000
Chennai Super Kings	Stephen Fleming	350,000
Chennai Super Kings	Suresh Raina	650,000
Chennai Super Kings	Michael Hussey	350,000
Chennai Super Kings	Mahendra Singh Dhoni	1,500,000
Chennai Super Kings	Parthiv Patel	325,000
Chennai Super Kings	Jacob Oram	675,000
Chennai Super Kings	Albie Morkel	675,000
Chennai Super Kings	Viraj Kadbe	30,000
Chennai Super Kings	Muttiah Muralitharan	600,000
Chennai Super Kings	Joginder Sharma	225,000
Chennai Super Kings	Makhaya Ntini	200,000
Delhi Daredevils	Virender Sehwag	833,750
Delhi Daredevils	Tilakratne Dilshan	250,000
Delhi Daredevils	Gautam Gambhir	725,000
Delhi Daredevils	Manoj Tiwary	675,000
Delhi Daredevils	Dinesh Kartik	525,000
Delhi Daredevils	AB de Villiers	300,000
Delhi Daredevils	Daniel Vettori	625,000
Delhi Daredevils	Shoaib Malik	500,000
Delhi Daredevils	Farveez Maharoof	225,000
Delhi Daredevils	Mohammed Asif	650,000
Delhi Daredevils	Glenn McGrath	350,000
Delhi Daredevils	Brett Geeves	50,000
Rajasthan Royals	Graeme Smith	475,000
Rajasthan Royals	Mohammad Kaif	675,000
Rajasthan Royals	Justin Langer	200,000
Rajasthan Royals	Younis Khan	225,000
Rajasthan Royals	Kamran Akmal	150,000
Rajasthan Royals	Yusuf Pathan	475,000
Rajasthan Royals	Dimitri Mascarenhas	100,000
Rajasthan Royals	Shane Watson	125,000
Rajasthan Royals	Sohail Tanvir	100,000
Rajasthan Royals	Shane Warne	450,000
Rajasthan Royals	Munaf Patel	275,000
Rajasthan Royals	Morne Morkel	60,000
Kings XI Punjab	Yuvraj Singh	1,063,750
Kings XI Punjab	Mahela Jayawardene	475,000
Kings XI Punjab	Ramnaresh Sarwan	225,000
Kings XI Punjab	Simon Katich	200,000
Kings XI Punjab	Luke Pomersbach	54,000
Kings XI Punjab	Kumar Sangakkara	700,000
Kings XI Punjab	Irfan Pathan	925,000
Kings XI Punjab	Ramesh Powar	170,000
Kings XI Punjab	James Hopes	300,000
Kings XI Punjab	Brett Lee	900,000
Kings XI Punjab	S Sreesanth	625,000
Kings XI Punjab	Piyush Chawla	400,000
Kings XI Punjab	Kyle Mills	150,000
Royal Challengers Bangalore	Rahul Dravid	1,035,000
Royal Challengers Bangalore	Shivnarine Chandrapaul	200,000
Royal Challengers Bangalore	Wasim Jaffer	150,000
Royal Challengers Bangalore	Misbah-Ul-Haq	125,000
Royal Challengers Bangalore	Ross Taylor	100,000
Royal Challengers Bangalore	Mark Boucher	450,000
Royal Challengers Bangalore	Shreevats Goswami	30,000
Royal Challengers Bangalore	Jacques Kallis	900,000
Royal Challengers Bangalore	Cameron White	500,000
Royal Challengers Bangalore	Anil Kumble	500,000
Royal Challengers Bangalore	Zaheer Khan	450,000

Team	Player	Final Bid Price (US$)
Royal Challengers Bangalore	Nathan Bracken	325,000
Royal Challengers Bangalore	Dale Steyn	325,000
Royal Challengers Bangalore	Praveen Kumar	300,000
Royal Challengers Bangalore	Abdur Razzak	50,000
Mumbai Indians	Sachin Tendulkar	1,121,250
Mumbai Indians	Sanath Jayasurya	975,000
Mumbai Indians	Robin Uthappa	800,000
Mumbai Indians	Loots Bosman	175,000
Mumbai Indians	Ashwell Prince	175,000
Mumbai Indians	Shaun Pollock	550,000
Mumbai Indians	Dominic Thornely	25,000
Mumbai Indians	Harbhajan Singh	850,000
Mumbai Indians	Lasith Malinga	350,000
Mumbai Indians	Dilhara Fernando	150,000
Deccan Chargers	V V S Laxman	375,000
Deccan Chargers	Rohit Sharma	750,000
Deccan Chargers	Herschelle Gibbs	575,000
Deccan Chargers	Chamara Silva	100,000
Deccan Chargers	Adam Gilchrist	700,000
Deccan Chargers	Andrew Symonds	1,350,000
Deccan Chargers	Shahid Afridi	675,000
Deccan Chargers	Scott Styris	175,000
Deccan Chargers	Rudra Pratap Singh	875,000
Deccan Chargers	Chaminda Vaas	200,000
Deccan Chargers	Nuwan Zoysa	110,000
Kolkata Knight Riders	David Hussey	625,000
Kolkata Knight Riders	Ricky Ponting	400,000
Kolkata Knight Riders	Salman Butt	100,000
Kolkata Knight Riders	Sourav Ganguly	1,092,500
Kolkata Knight Riders	Tatenda Taibu	125,000
Kolkata Knight Riders	Brendon McCallum	700,000
Kolkata Knight Riders	Chris Gayle	800,000
Kolkata Knight Riders	Ajit Agarkar	350,000
Kolkata Knight Riders	Mohammad Hafeez	100,000
Kolkata Knight Riders	Ishant Sharma	950,000
Kolkata Knight Riders	Shoaib Akhtar	450,000
Kolkata Knight Riders	Murali Kartik	425,000
Kolkata Knight Riders	Umar Gul	150,000

Source: Wikipedia

Appendix 2: Hedonic Price Equation*

Consider a utility maximization problem of an individual. The objective function and the constraint for utility maximization can be specified as:

(1) $Max\ U = f(X, Z)$ s.t. $M - P_i - X = 0,$

where Z is a vector representing a particular good in question with n quality attributes, $z_{i1}, \ldots, z_{ij}, \ldots, z_{in}$. X is a numeraire, composite commodity of non-Z goods, and M is income. An implicit assumption is that each individual purchases only one unit of the product in a given period t.

The basic assumption of the hedonic price analysis is that utility is enhanced not by the consumption of an economic good but by the characteristics of that good. Therefore, the market price of the good is the sum of the prices consumers are willing to pay for each characteristic that enhances its utility. With firms producing Z with a variety of combinations of its quality attributes, Z becomes a differentiated product. Applying first order condition for the choice of characteristics z_j we get:

$$(2)\quad \frac{\delta U/\delta z_j}{\delta U/\delta X} = \frac{\delta P_i}{\delta z_j}$$

Equation (2) is nothing but stating the law of equimarginal utility between two goods, X and z_j. $\delta P_i/\delta z_j$ is the marginal implicit price for characteristic z_j. Further, the utility function U can be rewritten as:

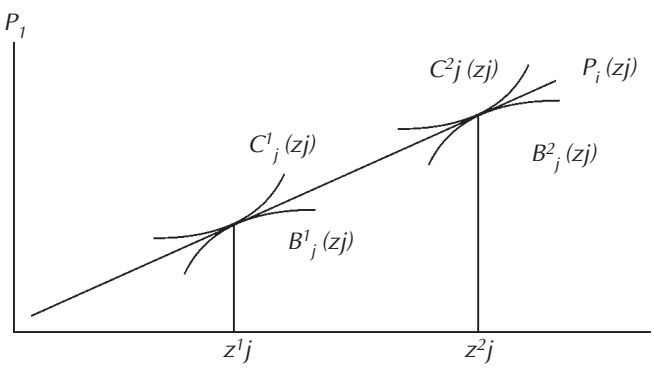
(3) $U = U(M - P_i, z_{i1}, \ldots, z_{ij}, \ldots, z_{in})$

Inverting equation (3) and solving for P_i with z_j as a variable and U^* and z^*_{-j} being held constant at their optimal values associated with problem in (1), we can write a bid curve B_j as follows:

(4) $B_j = B_j(z_j, z_{-j}^*, U^*)$

Holding other things at the optimal level, equation (4) describes the maximum amount an individual would be willing to pay for a unit of Z as a function of z_j. A well-behaved bid curve is ought to exhibit a diminishing willingness to pay with respect to z_j. Based on their individual preferences and/or incomes, consumers can have different bid curves $B^1_j(z_j)$ and $B^2_j(z_j)$ as shown in Figure 1.

Figure 1: Bid and Offer Curves in Hedonic Pricing



* Adapted from Schamel, Gabbert and Witzke (1998).

On the supply side as well, firm's cost of production depends on the characteristics of the product. Offer curve for the characteristic z_j derived from the firm's cost function can be represented by:

(5) $C_j = C_j (z_j , z_{-j}^*, p^*)$

Equation (5) explains the minimum price a firm would accept to sell a unit of Z as function of z_j, holding other attributes and profit at the optimal level. Offer curves $C^1_j(z_j)$ and $C^2_j (z_j)$ for two individual producers are also shown in Figure 1. In equilibrium, i.e., the situation in which consumers and producers trade Z for an agreed price, the bid and offer curves for the quality attribute z_j for each market participant must be tangent to each other. We assume that a straight line $P_i (z_j)$ represents these tangencies as shown in Figure 1. Thus, $P_i (z_j)$ represents the equilibrium locus for all individual bid and offer curves. We call this function the Hedonic Price Function. For a commodity Z with n number of attributes this Hedonic Price Function can be represented by the following notation.

(6) $P_i = g (z_{i1}, \ldots, z_{ij}, \ldots, z_{in})$

If the relevant information on various brands of the differentiated good Z is available, one should be able to estimate equation (6) econometrically. The results would indicate the relative importance consumers attach to the various quality attributes of Z.

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Cricket must be the only business where you can make more money in one day than you can in three.

— Pat Gibson