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Chamarajpet Cricket Club: Analysis of Team Performance

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A B S T R A C T

Globally, mathematical concepts has potentially been having a profound impact in arena of sports. Development of information technology and its advancements, stats and figures, along with mathematical subjects has a big impact upon athletics. Efficacy of a team or a group playing cricket is determined by each of its members in the team. The work of assessing and predicting a professional player's progress is tedious, time – consuming, yet is important. Eleven individuals are chosen from among a team of 15-20 individuals once after players are analyzed on various data-points and their traits. Depending on prior achievements and milestones, committees and boards involved in such activities, perform them independently and forecast their projections individually. As a result, choosing someone to involve in the game to represent in the squad gets complicated. Through examining how well a squad is performing, trainers, instructors as well as management could arrive at tactical choices that rely greater on evidences compared to reliance on intuitive thinking. Albeit, it being a challenging endeavor, using strategy of linear regression that takes into account various characteristics like economy rate, strike rate and many others, provides an important distinction in how effective the decision making procedure is. The work mainly concentrates to employ multiple linear regression to evaluate overall performance and strength of the squad represented by Chamarajpet Cricket Club which currently is a 5th division group that is affiliated to KSCA aka, Karnataka State Cricket Assosciation (KSCA).

Keywords: Regression, cricket, performance, strike rate, player, economy, prediction

1. Introduction:

Perhaps the most well-known games in entire history is the sport such as cricket commonly referred to as "Gentleman's Game. In Britain around the time of sixteenth century, this game had its inception. It expanded globally around both nineteenth and twentieth centuries after establishing itself as a national pastime in England throughout eighteenth century. This event has gained the greatest spectators and supporters globally. The emergence of distinct styles of the game like Indian Premier Leagues, One-Day Internationals, T20, followed by the financial rewards, multinational business entities, franchising's, personalities and attractions being a part of it have all greatly increased its reputation. Individuals of all ages appreciate the adrenaline rush that sports provide.

A squad of cricket consists of eleven possible participants as is a common knowledge. Entire team boasts an ideal balance of bowlers, batsmen and all-rounders. Maximum amount of runs must be scored by the batters and majority of stumps must be taken by bowling attack by limiting competing team's ability to accumulate scores. Whenever there is a proficient performance observed in a player, overall efficiency of the squad improves. Executive committee of ICC creates and drafts relevant game policies and procedures.

Efficacy of entire squad gets influenced by factors like competing squad, regardless of whether sporting event or the tournament takes place in their own turf, what hour of the day the tournament occurs etc. Identical to this, an individual player's game performance gets evaluated in contrary to various other measures like economy, current form, and strike rate. Choosing the right individuals therefore becomes important and crucial. Combining past data, the skills athlete possess and various other factors becomes crucial to devise an appropriate framework when studying and projecting individual achievement in each tournament including the final outcomes too. Players rating as well as their categorization, regardless of disciplines have emerged as key factors for academicians to undertake their studies on variety of sports related topics in today's rapidly evolving recreational context. Multiple linear regression is being employed in a number of studies for examining and forecasting tournaments and squad results along with analyzing their efficacies.

Incorporation of a combination of analytics and technological improvements in the athletics arena have made it easier for choosing players and as well analyse their performances to create strongest squads. For examining the efficacy, stats which possibly employ certain crucial factors, models with multiple regressions are used. Aforementioned frameworks are sometimes found to be adequate for assisting those involved in understanding what they need for development in methodical fashion [1]. Top eleven individuals that make up squad may be chosen based on their individual assessment of their performances utilizing traits for athletes as well as prior records. Employing cutting edge ML approaches, study's principal goal was to predict individual achievements in their ODI tournaments. This makes it easier for predicting and forecasting each player's individual performances, including amount of runs a player with bat will attempt to score along with number of stumps a fast bowler would successfully takes throughout specific game [2]. Idea of artificial neural networks could additionally be used to predict what amount of wickets or stumps an opponent's bowler will likely to pick up in specific

game or season. Analysis of spinners from all over globe gets laborious because research was confined to a maximum of 8 bowlers belonging to Indian cricket squad because this kind of framework has little information [3].

Royal Challengers Bangalore (RCB), a highly well-known franchise in IPL became subject of an analogous work by Ryanston Rodrigues. RCB has not previously been dominant in lifting IPL championship, although having some of top cricketers in entire globe on its roster. By establishing an all-time high by obtaining highest and lowest results of 263 and 49, correspondingly. Purpose about the study was to use statistical as well as mathematical principles to obtain understanding of how the RCB squad performed. To reach this goal, researcher decided to utilise charts and equations. Applying R software, a framework for predicting consequences of games is created by applying paradigm of logistic regression [4]. Principle of MLR helps with both computation and forecasting economy rate of bowlers and rating of batsmen in a certain tournament. These findings make it simpler for both mentors cricket board to pick squad members [5].

Forecasting the outcome of a match or tournament requires a number of distinct variables to be compared to a particular appropriate benchmark. Approach of Duckworth Lewis may be used in conjunction with MLR analysis for predicting striking team's scores throughout the innings and ultimately outcome of contest [7].During the initially played five overs of a cricket tournament, it becomes possible to anticipate as well as estimate number of runs that a specific squad will achieve. Depending on such information, players get categorized for restricted overs. Regression analyses may be employed for making these forecasts, while classifier algorithms such as KNN, MLP, Naïve Bayes, and SVM are used for classifications [8].

When forecasting such results of initial game during live broadcasting of tournaments, an assortment of regression as well as artificial intelligence techniques such as random forest regression may get used. Given that these tournaments are flexible in kind, it becomes essential for analysts attempting to make a forecast possess access to relevant prior statistics as well as thorough understanding about each aspect influencing these forecasts [9]. Bayesian classifiers can be leveraged to forecast outcome of a match based on variables like homeland turf plus its importance [10]. Principal component analysis techniques were used in evaluating how players performed and create rankings based on achievements in football leagues. According to participant's attributes, rankings may be established and all related players can be categorized, helping in picking of best candidates for building an efficient and a strong squad [6].

Present work seeks in forecasting effectiveness of cricket squad Chamarajpet Cricket Club in KSCA championship tournament – Sri J B Mallaradhya Trophy conducted in the year 2022-2023. Towards the final paragraph of the current article, readers will be able to utilise MLR analysis techniques for examining its efficiency in relation to both bowling as well as batting stats which are acquires for the aforementioned competition conducted in that particular duration.

1.1 Karnataka State Cricket Assosciation

KSCA also known as Karnataka State Cricket Assosciation aspires to transform the state, Karnataka, as a national powerhouse of cricket. It exerts constant efforts for enhancing welfare among its athletes. BCCI which is been linked with governing body began its operations from 1933-34. Executive committee became stronger and now boasts more than four thousand memberships from every community making itself as nation's best organized cricketer's assosciations. Purchase of a separate ground currently being referred to as M Chinnaswamy stadium occurs in latter half of 1960s.

Bangalore has grown into a hub by hosting Test fixtures along with ODI, comparable to World Cup quarterfinals held in 1966. Year 2011, witnessed hosting of 7 World Cup tournaments. Karnataka squad became successful in bagging Ranji Trophy on eight occasions, finished at second place for five times, and on four occasions won Vijay Hazare Trophy and additionally bagged Syed Mushtaq Ali Shield.

Anil Kumble, Javagal Srinath and Rahul Dravid are the major contributors to achievement of Karnataka's tournaments throughout 1990s, helping governing body to establish its presence in contemporary period. Syed Kirmani, Roger Binny, E A S Prasanna, B S Chandrasekhar amongst the other celebrities are responsible for remainder triumphs. C S Pitchamuthu, Rollo, Singaravelu Mudaliar, P Medappa, J B Mallaradhya contributed to success and good operation of Assosciation. M Chinnaswamy became notable figure in1950s.

Karun Nair, K L Rahul, Manish Pandey, Mayank Agarwal consistently contributed to glory of country.

1.2 Chamarajpet Cricket Club

This cricket club originated in 1996 and housed in Bangalore. This sports academy will provide youngsters between ages of 7 as well as 19 with focused, accredited instructions. The academy has a skilled as well as knowledgeable team on hand for ensuring so that kids may learn solid individuals within this fascinating sports of cricket. The team as well as the academy has proven itself profitable in signing up for participating in regional as well as other competitive tournaments under Bangalore region of KSCA.

2. Methodology:

According to KSCA internet page, squad as well as players information related to cricket squad were gathered. Majority of information employed for the current investigation relates specifically for the category of 1^{st} – 5^{th} category of J B Mallaradhya Shield for years 2022-23. Multiple regression analysis is being used for examining effectiveness of squad including their strong points consideration. Effectiveness and efficiency of a batsman is evaluated by considering their successful strike rates, while success of a bowler is estimated with rate of economy.

Linear multiple regression takes the form of:

$$\mathbf{y = c + b_0 x_0 + b_1 x_1 + b_2 x_2 + \ldots\ldots + b_n x_n + e} \quad (1)$$

Where,

y is the dependent variable

$x_0, x_1, x_2, \ldots. x_n$ are independent variables

c is the constant or also known as the y intercept

$b_0, b_1, b_2, \ldots\ldots, b_n$ are slope values

e is the error involved.

2.1 Variables:

Table I – Variables used in the study

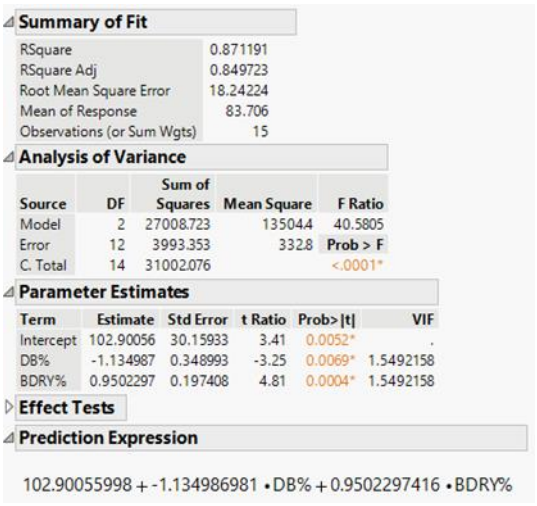
Variables	**Abbreviations**
M	Matches Played
I	Innings
R	Runs Scored
B	Balls Faced
HS	Highest Score
NO	Not Out
AVG	Average
SR	Strike Rate
DB%	Dot Ball Percentage
BDRY%	Boundary Percentage
Bdry Freq	Boundary Frequency
Dot Freq	Dot Ball Frequency
O	Overs
MD	Maiden
WKTS	Wickets Taken
ECON	Economy
NB	No Balls
WB	Wide Balls

3. Interpretation:

Larger values for correlation amongst independent factors are removed. An analysis based on multiple regression is undertaken and related outcomes were as follows.

Batsmen's rate of strikes (SR) which is a variable that is assessed to be a dependent factor, while factors being independent are dot ball percentages and boundary percentages – DB% and BDRY% correspondingly.

Dot ball percentage along with boundary percentages accounts for 87.1% of variability in batter's striking rate. Various other variables accounts for remainder of variability depicted by the r square values. Predictive model is 84.9% consistent and fit.



Summary of Fit

RSquare	0.871191
RSquare Adj	0.849723
Root Mean Square Error	18.24224
Mean of Response	83.706
Observations (or Sum Wgts)	15

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	27008.723	13504.4	40.5805
Error	12	3993.353	332.8	Prob > F
C. Total	14	31002.076		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	VIF
Intercept	102.90056	30.15933	3.41	0.0052*	.
DB%	-1.134987	0.348993	-3.25	0.0069*	1.5492158
BDRY%	0.9502297	0.197408	4.81	0.0004*	1.5492158

Effect Tests

Prediction Expression

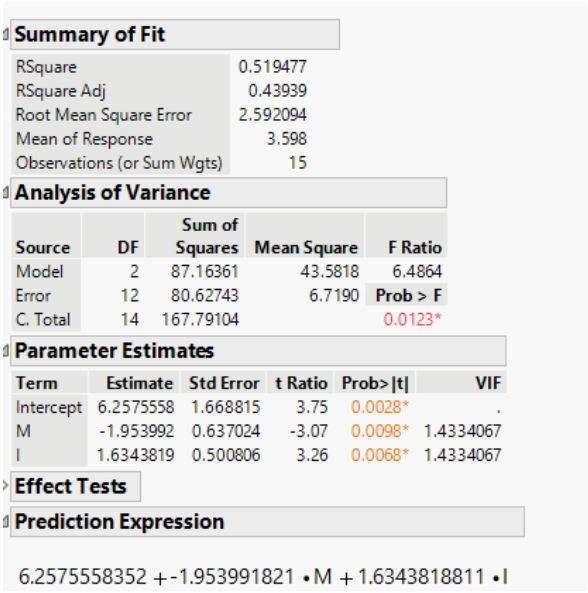
102.90055998 + -1.134986981 • DB% + 0.9502297416 • BDRY%

Fig 1: Model for analysing batting performance

The expression obtained is as follows:

SR=102.9056+0.95022*BDRY%+ (-1.1349)*DB% ***(2)***

Where in the aspect of batting, DB% stands for the percentage a player faces dot ball and BDRY% means the total percentage of runs a batsman scores through boundaries. Strike rate here demonstrates batting strike rate of a player which is calculated as the total number of runs a batsman scores for each ball he faces.



Summary of Fit

RSquare	0.519477
RSquare Adj	0.43939
Root Mean Square Error	2.592094
Mean of Response	3.598
Observations (or Sum Wgts)	15

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	87.16361	43.5818	6.4864
Error	12	80.62743	6.7190	Prob > F
C. Total	14	167.79104		0.0123*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	VIF
Intercept	6.2575558	1.668815	3.75	0.0028*	.
M	-1.953992	0.637024	-3.07	0.0098*	1.4334067
I	1.6343819	0.500806	3.26	0.0068*	1.4334067

Effect Tests

Prediction Expression

6.2575558352 + -1.953991821 • M + 1.6343818811 • I

Fig 2: Model for analysing bowling performance

Next while analysing efficacies of bowlers in squad, multiple regression has been conducted and outcomes are outlined. Overall number of innings as well as matches participated were variables that are independent while bowler's economy is a dependent one.

Matches as well as innings account for 51.9% of variation in bowler's economy. Unaccounted variables affect the model's variability. The forecasting model is observed to be 43.9% suitable. Forecasting expression is found to be:

ECON= 6.256+ (-1.954)* M + 1.634 * I ***(3)***

Here economy rate of a bowler means the total number of runs a bowler concedes per over they bowled.

3.1 Final Interpretation:

It is possible to infer how and where the squad's dominance lies in, whether within its striking orders based upon the compiles offensive as well as defensive stats of related individuals. Statistical models was identified to be 85% appropriate to evaluate batsman statistics and 44% acceptable with respect to bowler statistics. Evaluating Durbin and Watson test shows that there is 0 autocorrelation among variables that are not dependent.

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation	Prob<DW
2.0449956	15	-0.0705	0.3979

Fig 3: Durbin Test for batting model

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation	Prob<DW
2.6338939	15	-0.3265	0.8556

Fig 4: Durbin Test for bowling model

By selecting effective players and working towards enhancing their present efficiency, club can bolster itself and compete effectively in more tournaments. According to the club's total statistics, squad was dominant in claiming 3 among four games played during J B Mallaradhya trophy event.

Conclusion

Making tactical choices regarding selection constitutes an important component of a squad formation. Exceptional player squad with an ideal balance of both offensive and defensive lines makes up a good one. Goal of research investigation was to evaluate squad's effectiveness using metrics of all players. Owing to lack of pertinent details and information, additional elements including conditions of pitch along with associated considerations hadn't been taken under account. Employing JMP applications, multiple regression was conducted to examine both bowling as well as approaches towards batting.

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