The "make up factors concept" to improve the targets in interrupted limited over cricket matches.

I. Introduction

The Duckworth-Lewis system (1) is employed at the international level in calculating the targets in limited over cricket since 1998. From a very ordinary method in 1998, prone to give unrealistic results frequently, this system has grown up to a pretty satisfactory method now giving fair targets in majority of situations. An alternative for this system proposed by the author the "VJD-System" is also in the picture for the last 10 years (2,3) and many have rated (4,5,6,7) this system as a better alternative to the D/L system in target score calculations. But, there is an area where both the D/L and the VJD systems are equally lacking perfection. This is when the interruptions occur while team-2 is batting and very few balls/overs are left after the interruption. Situations might be created where:

i. Target is highly unreachable for team-2 or
ii. The score of team-2 is already above the target so that whatever happens in the remaining overs/balls tam-2 wins.

In T20 format this problem can raise very frequently.

II. Illustrations

To illustrate the above mentioned situations, first let us take the well-known case of South Africa England semi-final in world cup 1991-92. Chasing a target of 254 in 45, SA were 231/5 in 42,5 overs when the match interrupted. Requirement was 23 runs from 13 balls at the time of interruption. After the interruption, when the match resumed, only 1 ball was remaining and by both D/L and VJD systems, the target in 43 overs is 234, i.e. three runs from the last ball. The then followed method set a target of 22 runs in one ball which lead to the end of using that system after world cup 91-92.

Here, it is interesting to note that the South African score 231/5 at the interruption was in balance with the par scores of both D/L and VJD systems at the position of interruption. This is one vital reason for these methods providing good results. Suppose South Africa were 225/5 at interruption

(instead of 231/5), the result would have been 9 runs (the target would remain 234 itself) from 1 ball which is practically not possible. While there was still some possibility, though feeble of scoring 29 from 13 balls for South Africa before the interruption, after the interruption the probability is reduced to nil. Now suppose South Africa were 234/5 at the time of interruption, in the remaining one ball, they win even if they do not score any run in that last ball, because they have already above the par score one ball in advance. Before the interruption they were requiring 20 runs from 13 balls, which was not that easy a target, but they get the match without any effort when the interruption lifted 2 overs.

Let us take another example, Nat West series final between England and India. Against England's 321, India were 146/5 in 23,3 overs at one stage. Then, if the match were reduced to 25 overs, India's target would have been 202 runs as per D/L and 204 as per VJD. That is more that 6 runs per ball indicating zero possibility for India to win. As per the "vjd2007" software the latest one of the vjd-system (which also provides a chance analysis option), before the interruption the chances for England and India were 61.5% and 38.5% respectively. But when the target was reset, the chance became 99.99% and 0.01% respectively. But, there were no interruptions and India went on to win the match in the end. Here, the slight chance that India had at the interruption is not recognized by both the methods.

In another match, against Australia's 252 in 50 overs, West Indies were 138/1 after 29 overs when the match interrupted. In the actual match, the number of overs was reduced to 40. But consider here a case where 18 overs were lost in that particular match and the length of the match was curtailed to 32 overs. At the time of interruption the requirement for WI was, 115 more runs from 21 overs. Ie. @5.48 runs per over. Fairly comfortable but not guarantied. In 32 overs the target score for W.I. would be 138 runs as per D/L and so W.I. win the match without playing any of the remaining balls as they have already made those runs. The VJD system does far better in this case, as the target is of 150 runs. W.I. would have to make 12 runs in the remaining 3 overs.

From the point of view of resources available and resources utilized (the basis of D/L system), mathematically this cannot be treated as an anomaly. But from the angle of probability, one team is loosing the entire

probability it had before the interruption while the match is rescheduled. Hence from the point of view of the game, this definitely is a shortcoming.

Let us take once again the England India Nat west series final as example. As per the D/L system, the par score in 23,3 overs for the loss of five wickets is 187 runs, and India are 41 runs short of the par score at that time. In the process of uninterrupted completion of the game, India have 26,3 overs to make up this deficit (around 1½ runs per over). When the match is curtailed to 25 overs, just 9 more balls are left after the interruption. In addition to the 15 runs that India have to make for the remaining 9 balls, the present system is asking to make up the entire 41 runs deficit also in the span of 9 balls. This is clearly unfair and a suitable reduction in those 41 runs is essential. Similarly in the third example the par score (by D/L) after 29 overs with just one wicket lost is 112, and W.I are 26 runs ahead of that at the time of interruption. If the match goes uninterrupted Australia has 21 overs to pull back this advantage. But even when only 3 overs are left, the entire advantage of 26 runs is offered to W.I., which is also unfair.

II. How to solve the problem.

The authorities are quite aware of this anomaly. But it is very tough to suggest a pragmatic solution, which also takes care of subsequent interruptions with out affecting the continuity and maintaining the internal consistency. If a proportionate reduction/addition is effected it can be highly beneficial to the team which is behind at the time of interruption. A method suggested by the author (8) works well if there is no further interruptions but doesn't possess the continuity in case of a subsequent interruption.

Now, with wide acceptance of a fully computerized method a pragmatic solution to this problem became possible. After analyzing a number of semi-real/semi-hypothetical cases, similar to the ones cited in illustrations above, the author has developed a consistent method to solve this problem.

Here, a make up factor is introduce which is defined as

M_f = (Par score - Actual score) * f(x)

Where f(x) be an empirical function in which 'x' is the ratio between 'the overs remaining after the interruption' to 'the overs remaining before the interruption'.

This modification factor will be added up or subtracted from the par score to compute the made up par score which will be carried on for further calculations and hence the continuity and consistency will be maintained. For subsequent interruption, which occurs even before a single legal ball is bowled, to maintain the consistency of results the interruption is treated as continuous. The values of f(x) worked out in a spread sheet is transferred in to the computer program to effect the calculations.

It will be interesting to check how this modification will affect the results in the examples shown in the illustrations. *(Calculations are done with'software' developed by the author.)*

1. Take the example of England vs. South Africa match:

i If the score were 225/5 in 42,5; the target in 43,0 would have been 231, i.e. 6 runs from the remaining ball.

ii If the score were 227/5, under the same situation, target will be 232, i.e. 5 runs from the ball left.

iii If the score were 236/5, under same situation, target will be 237, i.e. 1 run from the final ball.

In this case as the remaining part is just one ball; beyond a score of 238 again team-2 wins without scoring any run. Anything better with just one ball remaining, it is easier to be said than done.

2. The example: England vs. India.

i. Target for India in 25 overs will be 175 runs; i.e. 29 runs from 9 balls, the remote chance that India had at 23, 3 overs is retained.

ii. Due to a subsequent interruption at 23, 4 overs when India were 152 (hit a six in the one ball played after first interruption) the match terminated. Winning score is 156 and hence England wins.

iii After the first interruption suppose the second interruption is at 172/5 after 24, 5 overs. Here the winning score is 173 and hence India just ties with England.

(It can be seen that the advantage that England has at the first interruption is retained through out)

3. The example: Australia vs. West Indies.

i The target score in 32 overs will be 158 runs, another 20 runs from 3 overs which look ideal.

ii A subsequent interruption occur after 30,0 overs when WI had lost 2 more wickets without adding any run. 138 here is a winning score and hence they win.
(From this it can be seen that the system gives importance to the situation where WI were at the first interruption and the set back they face on re-start doesn't affect them too much.)

iii Instead of 138, if W.I. score were 120/1 at interruption. The target would be 149 ie. 29 runs from 3 overs. Under this condition if W.I lose two wickets without scoring any run in the 30^{th} over they loose. If they score 8 runs and loose two wickets in the 30^{th} they tie with Australia. High degree of maintenance of balance of situations can be observed here.

5. A recent example from T20, England vs. West Indies.

England makes 191 in 20 overs. In reply, When West Indies were 30/0 in 2,2 overs the match got interrupted and shortened to 6 overs. D/L target was 60 and vjd- target is 61. Normally the expected score after 2,2 overs is 18-20 runs. The advantage of the additional 10-12 runs WI scored would have distributed over 17,4 overs in normal course (0.64 runs per over). But now it is distributed over 3,4 overs (3.27 runs per over), which is not fair. I have not yet worked out the empirical relation of the modification factor for T20. But applying the same one used for T50, the target increases to 64. For other scores (imaginary situation after 2,2 overs) of WI, 0/0, 15/0 and 40/0 the target scores will be 53,59 and 68 respectively. If the proper empirical relation for T20 is worked out target for 30/0 might reach 66-68 which would perhaps be ideal.

IV. Conclusion

The VJD system of setting targets in limited over cricket matches developed by the author, even without this proposed improvement gives

fairer results than the D/L system followed by the ICC. This improvement puts this system into further heights. But the authorities are taking a negative attitude to this system which is developed without any technical or financial assistance from the ICC or BCCI. If authorities show some interest and consideration to this system the author can develop in a week or two a very good system for T20 matches by working out the new empirical relation for T20 matches.

V. References

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