

Net Run Rate – *Even more important in the Super 10 than Qualifier stage.*

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Abstract

The 2016 ICC World T20 Qualifier and Super 10 stages are logically analysed in terms of patterns of possible outcomes of the final results tables. The analysis concentrates on the likelihood of points ties where qualification to the next stage is determined by Net Run Rate. Factors discussed include ‘No Results’ (e.g. caused by bad weather), teams of differing strengths within groups, group size, and number of qualifying teams. It is logically demonstrated that Net Run Rate is likely to be even more important in the Super 10 stage than in the Qualifier stage.

The Qualifier Stage

During the first few matches of the 2016 ICC World T20 Qualifier I started to wonder about the importance not just of winning, but of winning well, in other words, how important is achieving a good **Net Run Rate**? (NRR – see Appendix I for definition). I went off and spent several dozen hours building and writing about various logical models before I abandoned the exercise as too complicated for a non-scientific, cricket reading public. Furthermore, part of my answer was that ‘Ties’ (which are unlikely) and ‘No Results’ significantly elevated the importance of teams maximising their NRR from their first match. It was ironic that as I did the sums, the heavens opened above India and the Dharamsala deluge did indeed cause sufficient No Results to affect significantly one of the two Qualifier groups (A).

One realisation that I had was that for each group there were only a very limited number of final outcome patterns, provided all the matches were actually played. What I mean by “final outcome patterns” is the state of the results table at the end of the Qualifier. In fact, provided all the matches do have a win/lose result, there are only four possible patterns of results; these are shown in Table 1.

| Position | Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4 |
|-------------------|-----------|-----------|-----------|-----------|
| 1 st . | 6 | 6 | 4 | 4 |
| 2 nd . | 4 | 2 | 4 | 4 |
| 3 rd . | 2 | 2 | 4 | 2 |
| 4 th . | 0 | 2 | 0 | 2 |

Table 1. *Final outcome patterns of points scored (all matches played to a win/lose).*

In this 2016 ICC competition only one team from each of the Qualifier groups goes through to the next stage, the ‘Super 10’. In Table 1, if Pattern 1 or 2 occurs then whichever team finishes first qualifies, purely on points, for the next stage (e.g. in 2016 Group B ended in Pattern 1 and Afghanistan qualified). Final first position for the other two patterns, however, depends on NRR as the top two teams have four points in Pattern 4 and three teams tie on four points in Pattern 3. The Table 1 analysis thus leads to the conclusion, even when all six matches in a group does have a win/lose result, that NRR is vital because in half the possible final points outcomes the team that will qualify will do so on NRR.

On a mild cautionary note, if one cares about which team ends up in which position, as most people do, then it needs realising that there are 24 different possible positions of four teams (six in which each of the four team comes first [see Appendix II]) and with four patterns then there are 96 (24 x 4)

logically possible final results tables. One way to understand this is that if one had no information about the teams, then one would have about a 1% chance of guessing what would be the final table, the order of the teams and how many points each would score.

This leads to a greater concern regarding the conclusion that for half the possible final outcomes the team that finishes first and qualifies will do so on NRR, that the four teams are not of equal ability. An easy way to understand Table 1 is to imagine flipping a coin to decide the result of each match. In this case the conclusion of 50% of first position results depending on NRR would be valid. This can be contrasted with a situation where one team (A) of the four is very much better than the other three (X, Y and Z) and so it is almost certain that A will win all three of its games, i.e. the final table will follow either Pattern 1 or 2. Note, however, that if teams X, Y and Z are equally bad compared to team A, then Patterns 1 and 2 are equally likely to occur, i.e. while Pattern 2 reflects the actual situation (one team being much better than the other three, who are of equal ability), Pattern 1 is just as likely to be the final situation if one were tossing a coin to determine the results between teams X, Y and Z.

Modelling groups where there are teams of different strengths is the work alluded to above that I thought too complicated to publish for a non-scientific audience. The general effect, however, is to reduce the 50% qualifying conclusion concerning the importance of NRR, but not to such an extent that teams can afford to be complacent about it in most situations where not all teams are equally proficient.

The above is predicated on the assumption that all six matches played in a group end in a win/lose result. In cases where this is not so, most commonly No Results due to bad weather, then the general effect is to increase the likelihood of points ties and so increase the importance of a good NRR. The analysis is possible but extremely complicated because the effects depend on which match, or matches, have points shared between teams. In the case where one match is lost, then for Pattern 1 there are six possible final outcome results and in one instance, if it is the teams that will end up first and second in Table 1, then these teams now will tie on points and the team with the better NRR will qualify. Table 2 shows this in its second column where the original points pattern (column 1) of 6-4-2-0 becomes 5-5-2-0.

| All are Win/Lose Results | 1 st v 2 nd Share Points | 1 st v 3 rd Share Points | 1 st v 4 th Share Points | 2 nd v 3 rd Share Points | 2 nd v 4 th Share Points | 3 rd v 4 th Share Points |
|--------------------------|--|--|--|--|--|--|
| 6 | 5 | 5 | 5 | 6 | 6 | 6 |
| 4 | 5 | 4 | 4 | 3 | 3 | 4 |
| 2 | 2 | 3 | 2 | 3 | 2 | 3 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 |

Table 2. Effect of one match not resulting in a Win/Lose result (i.e. points are shared) on the Pattern 1 outcome. The teams are identified by their final position in Table 1 (1st. to 4th.).

Similar tables can be prepared for the other three patterns derived from Table 1 and then much larger tables could be constructed for when more than one match has shared points. The effect is to compress the range of the final outcome table. The extreme case would be where there were No Results for all the six matches; all four teams would have 3 points, although as there would be no NRR then the team with the best ICC ranking would qualify. That compressing the final points range increases the probability of teams tying on points is not surprising, which is not to say that it isn't worth demonstrating, as in Table 2, and a fuller analysis is not without interest.

The 2016 Qualifier stage has already ended, but the type of analysis presented above may be of aid to organisers of future competitions. This article was written before the start of the Super 10 stage of the

ICC 2016 Twenty20 championship and a similar analysis is presented below and which may provide an aid to those wanting to understand the logical basics of the possible outcomes.

The Super 10 Stage

In the Super 10 stage there are again two groups, but this time of five teams each. The top two teams in each group will then go through to the semi-final and final knockout stage which will determine the competition winner. There will be a total of 20 matches in the Super 10, 10 for each group as each team will play four matches, i.e. once against each other side in the group. Table 3 replicates Table 1 for the Super 10 stage so shows all the possible final table outcomes, assuming all matches have a win/lose result.

| Posn. | Pat. 1 | Pat. 2 | Pat. 3 | Pat. 4 | Pat. 5 | Pat. 6 | Pat. 7 | Pat. 8 | Pat. 9 | Pat.10 |
|-------------------|----------|--------|--------|----------|----------|----------|--------|--------|----------|----------|
| 1 st . | 8 | 8 | 8 | 8 | 8 | 6 | 6 | 6 | 6 | 4 |
| 2 nd . | 6 | 6 | 6 | 4 | 4 | 6 | 6 | 6 | 4 | 4 |
| 3 rd . | 6 | 4 | 2 | 4 | 4 | 6 | 4 | 4 | 4 | 4 |
| 4 th . | 0 | 2 | 2 | 4 | 2 | 2 | 4 | 2 | 4 | 4 |
| 5 th . | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 2 | 2 | 4 |

Table 3. *The ten possible patterns (Pat. 1 – 10) of final points scores assuming no points are shared in any match. Points ties that will determine which team progresses to the semi-finals based on Net Run Rate (NRR) are shown in bold-italic.*

Table 3 emphasises the importance to teams of not only winning, but also maximising their NRR as 60% of the possible final outcomes involve points ties (Patterns 1, 4, 5, 6, 9 and 10). This can be contrasted with the Qualifier results (Table 1) where 50% of outcomes depended on points ties. The 10% increase in the likelihood of NRR affecting Super 10 qualifying outcomes is due to two factors that operate in opposing directions. First, the more matches played the less will be the probability of final points ties (obviously, if thousands of matches were played between a few teams, then the probability of final points ties would be virtually zero). Second, however, is the number of teams that go through to the next stage (1 per group in the Qualifier and 2 per group in the Super 10). It is this latter factor that demonstrably has a stronger effect than the increase in matches played (6 per group in the Qualifier and 10 per group in the Super 10).

That final points ties are more likely, and therefore NRR is likely to be even more important at the Super 10 stage than the Qualifier stage, is not an obvious result as it involves the *relative* effect of two factors operating in opposite directions. It is important that teams, the media and many followers/fans appreciate this logically derived conclusion. Net Run Rate really does matter! And even more so in the Super 10 than Qualifier stage.

As a reminder (see Table 2), if one or more matches do not come to a win/lose result and points are shared, then final points ties become even more probable and NRR even more important. Indeed, it may be a matter of only a few runs in one match, even one a team loses, that might determine whether a team makes the semi-finals.

As I follow the Super 10 matches I look forward to hearing from others about poor fielding, missed stumpings, dropped catches, comedy runouts, etcetera and commentators saying on-air, “That won’t help their Net Run Rate, which logically we know is likely to be critical – *Thank you, Dr. Dan.*”

Dr. Dan Diaper – 15th. March, 2016.

Appendix I

Net Run Rate (NRR) is calculated as:

$$(\text{Total Runs Scored} / \text{Total Overs Faced}) - (\text{Total Runs Conceded} / \text{Total Overs Bowled})$$

and where 'Total' refers to the sum from all matches played.

Appendix II

For four teams (A, B, C and D) there are 24 ways that teams might end up ordered. In the case where team A is in first position, there are six ways as demonstrated in the table below. Three similar tables can be constructed where either teams B, C or D are in first position.

| | | | | | | |
|------------------------|---|---|---|---|---|---|
| 1st. | A | A | A | A | A | A |
| 2nd. | B | B | C | C | D | D |
| 3rd. | C | D | B | D | B | C |
| 4th. | D | C | D | B | C | B |