The Duckworth-Lewis-Stern method

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So the core of the original Duckworth Lewis methodology was the concept of what they called scoring resources. And to put it in sort of economic terms, run, run scoring patterns in cricket are essentially what they would call a production frontier. So in other words, teams that are batting in cricket wants to maximise their run output by optimally utilising their input resources, their available overs and their wickets in hand. And what duck was and Lewis did was they use data available to them at the time to estimate that production frontier. And that allowed them to essentially assign an expected proportion of a team's total score to any particular over during the innings based on when that image over was during innings and how many wickets were available. And ultimately, what that means is that they could, you know, assess what proportion of a team's scoring potential might have been lost if the any was shortened by rain or some other interruption. So for example, they could say, well, this team lost these overs that represents 22% of their scoring potential. And therefore, to make a fair adjustment in the game, their new targets should be 22% reduced from what they were, the original target was. So when Duckworth Lewis were working in the mid 1990s, teams were still primarily familiar with strategies from the long form of the game. And so overall scores tended to be much lower than they are today. Whereas when I started my work in the late 2000s, in the early 2010s, that had been the influence of ti 20, crickets and of course, a longer experience with limited over games. And that meant that teams were scoring much, much higher than they had been. And what I was able to discover by looking at that new data was that the structure of that production frontier for run scoring changes as the overall score gets higher and higher. And I was able to model that change The basic idea is that in the old scoring patterns, there was a noticeable acceleration in scoring toward the end of the innings. Because as the batsman got closer to the end, they were able to play riskier and more but more rewarding shots, because they were less concerned about losing all of their wickets before the innings was done. However, that acceleration pattern has to be damped a little bit as the overall scores get higher and higher, it's just not possible to continue achieving them. And the nature of that damping. Right is not uniform across the innings. So my research primarily was to model the shape and the nature of that damping effect. There have been a number of various proposed competitors DLS. Most of them have been put forward, though, on the basis of claims regarding individual matches. And I don't feel that that's a sensible approach to that problem, because it relies on people believing that there was quote, a right answer to any given match. And given the subjectivity of the game. I don't think you'd ever get consensus of that kind. So instead, to me, there are a set of general principles that are used for comparison purposes and that any competitor would have to undergo to see if it was a sensible or reasonable competitor. That way you have more justifiable grounds. I'm making

these comparisons. So I propose five general principles. And the first two are just sort of housekeeping. what I call monotonicity requirements. They basically say that a team of adding team shouldn't be penalised for scoring more runs since obviously, their goal is to score as many runs as possible. And the bowling team shouldn't be penalised for taking more wickets, because that's their goal. But the other principles basically centre around making sure that the new proposals preserve the nature of the game. So for example, the third principle is based on the timing of runs, and basically says that the decision about who wins or Losing a match should not be dependent on when during an innings running runs are scored only their final total. So in other words, if a team scores 250 runs, but they had an interruption in the middle of their innings to do that, whether they win or lose shouldn't be dependent on whether some of those runs were scored, before the break in somewhere scored after the break, it only depends on the total number. And then other others are more get more technical around the game. So example the fourth principle basically, is around the concept of what's called a par score. Now par score, it will different methods will will differ as to the actual value but all methods have a power score, which is essentially the score at which if the match were ended at a particular moment, it would be called a tie. So that's what a power score indicates. And one of the fourth principle that I propose says Look, if a match is it is currently interrupted and it's at par, so it's evenly poised. Then when it resumes, it should still be evenly poised. Rain break, have a completely even match shouldn't benefit either side.

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And then finally, there's a fifth principle, which is essentially about the nature of how one calculates these proportions of scores. And it says that it shouldn't matter whether a set of overs was actually played by the team, or whether we're estimating it based on using our method and arrangement interruption, that the amount of scoring potential for a particular set of overs should be independent of that. So I think those those five rules encapsulate sort of the nature of what a cricket match should look like. And those are the methods the principles in which all methods should be compared. And today, all the main competitors to TLS essentially fall down on at least one of those principles, which is why I believe that TLS is still the current choice for it. There is a method I'm aware of by Ian McHale and his colleagues, which is, which does satisfy all those principles, but it's very, very similar to to DLS differs on some very, very technical details. So it's not really a major change, or in the structure at this point, I don't think there's any competitor to TLS that satisfies all those fundamental principles. And so there's not another option to use. But on the other hand, I mean, I'm always on the lookout for potential improvements. In fact, I would only I'm only involved in DLS, because dnl we're happy to take on board what probably was a completely out of the blue communication to them that I made back in, as I said, the early 2000s writing to them about ideas that I had about the message so I'm always constantly looking for the next big thing. I in particular, the scope of modern machine learning techniques is always something that might have be added to the mix. I think some people have chosen to attempt to do that in ways that I think are a little bit over, over reaching, which has to do with trying to take account for example of too much mass specific information, for example, which batsman were actually playing which boulders were playing. I

don't think that's appropriate to a generic rule that's more appropriate if you're worried about betting on games. But there is still definitely scope for additional research to try and make advancements on based on more modern data analytics.