Some alternative men's singles grand slam scoring systems

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Aim

To create a men's singles grand slam scoring system that reduces match length by changing only the game structure. In doing so the alternative scoring system should reflect the currently adopted systems in terms of the chances of the better player winning the match.

Alternative game structures

No-Ad: To win a game server and receiver must win 4 points. At most 7 points are played in this game

60-50: To win a game server must win 5 points and receiver must win 4 points. At most 8 points are played in the 60-50 game

50-40: To win a game server must win 4 points and receiver must 3 points. At most 6 points are played in the 50-40 game

50-40*: To win a game server must win 4 points and receiver must win 3 points. However if the score reaches 40-30, then a player must win two more points to win the game. At most 8 points are played in the 50-40* game

Characteristics of alternative scoring systems

Let p_A and p_B represent constant probabilities for player A and player B winning a point on serve respectively. For each of the above game structures (including the standard deuce game) the following characteristics are obtained. Note that the chances of winning a match and the chances of reaching score lines in a set are obtained using recursive formulas and the chances of a match going beyond a given amount of time is obtained by simulation. The amount of time to play a point is taken as 12 seconds to represent the average amount of time to play a point on clay (the slowest of all the surfaces). The characteristics are:

(i) Chances of winning a best-of-5 final advantage set match
(ii) Chances of winning a best-of-5 all tiebreak set match
(iii) Chances of winning a best-of-3 final advantage set match
(iv) The chances of a best-of-5 final set advantage match going beyond 4.5 hours
(v) The chances of a best-of-5 all tiebreak set match going beyond 4.5 hours
(vi) The chances of reaching 24 games-all in an advantage set

Results

Serving Probabilities	(i)	(ii)	(iii)	(iv)	(v)	(vi)
p_A=0.53, p_B=0.50	69.4%	69.3%	65.8%	12.5%	12.4%	0.0%
p_A=0.63, p_B=0.60	68.4%	68.4%	65.2%	13.8%	11.0%	0.0%
p_A=0.73, p_B=0.70	67.3%	66.6%	64.5%	16.9%	13.2%	2.1%
p_A=0.83, p_B=0.80	67.7%	65.1%	65.7%	30.2%	22.4%	45.0%

Table 1: Characteristics of scoring systems using standard deuce games across a range of serving probabilities

‘Long’ matches have typically been known with the advantage final set and this is due to both players recording ‘high’ serving probabilities. From table 1 for example there is a 2.1% and 45.0% chance of an advantage final set reaching 24 games-all for p_A=0.73, p_B=0.70 and p_A=0.83 an p_B=0.80 respectively. However ‘long’ matches can still occur with a best-of-5 all tiebreak set match due to the amount of time to play a point, the number of points played in a game and the number of games played in a set. For example there is a 12.4% and 11.0% chance of a match going beyond 4.5 hours in a best-of-5 all tiebreak set for p_A=0.53, p_B=0.50 and p_A=0.63, p_B=0.60 respectively.

Serving Probabilities	(i)	(ii)	(iii)	(iv)	(v)	(vi)
p_A=0.53, p_B=0.50	67.2%	67.2%	64.0%	2.0%	0.9%	0.0%
p_A=0.63, p_B=0.60	67.1%	66.9%	63.9%	2.9%	1.5%	0.0%
p_A=0.73, p_B=0.70	66.9%	66.4%	63.9%	8.9%	3.1%	0.7%
p_A=0.83, p_B=0.80	67.9%	65.9%	65.6%	25.3%	10.5%	28.9%

Table 2: Characteristics of scoring systems using No-Ad games across a range of serving probabilities

The No-Ad game has reduced the match length for both tiebreak and advantage final sets. However in doing so, the chances of the better player winning the match have also been reduced. From table 2 for example the chances of player A winning a best-of-5 all tiebreak set is 67.2% (reduction of 2.1%) and 66.9% (reduction of 1.5%) for p_A=0.53, p_B=0.50 and p_A=0.63, p_B=0.60 respectively.

Serving Probabilities	(i)	(ii)	(iii)	(iv)	(v)	(vi)
p_A=0.53, p_B=0.50	68.1%	68.0%	64.7%	11.2%	8.7%	0.0%
p_A=0.63, p_B=0.60	68.6%	68.5%	65.1%	11.8%	12.9%	0.0%
p_A=0.73, p_B=0.70	68.7%	68.4%	65.4%	18.1%	17.8%	0.1%
p_A=0.83, p_B=0.80	69.4%	67.8%	66.6%	33.3%	29.1%	12.2%

Table 3: Characteristics of scoring systems using 60-50 games across a range of serving probabilities

The 60-50 game has increased the chances of the better player winning the match. However in doing so has increased the match duration. This seems logical for ‘high’ serving probabilities since the 60-50 game requires the server to win 5 points (compared to 4 points for a standard deuce game).

Serving Probabilities	(i)	(ii)	(iii)	(iv)	(v)	(vi)
p_A=0.53, p_B=0.50	66.0%	65.9%	62.9%	0.1%	0.0%	0.0%
p_A=0.63, p_B=0.60	66.6%	66.6%	63.5%	0.2%	0.0%	0.0%
p_A=0.73, p_B=0.70	67.4%	67.2%	64.1%	0.9%	0.0%	0.0%
p_A=0.83, p_B=0.80	68.9%	68.2%	65.7%	6.8%	0.5%	2.2%

Table 4: Characteristics of scoring systems using 50-40 games across a range of serving probabilities

The 50-40 game has reduced the match length and although the chances of the better player winning have decreased for the ‘lower’ range of serving probabilities (p_A=0.53, p_B=0.50 and p_A=0.63, p_B=0.60), there has been an increase in the chances of the better player winning for the ‘higher’ range serving probabilities (p_A=0.73, p_B=0.70 and p_A=0.83, p_B=0.80). Note that the chances of winning for the better player in a best-of-5 set match using 50-40 games are greater for all serving probabilities when compared to a best-of-3 set final set advantage match with standard deuce games. Interestingly the chances of reaching 24 games-all are significantly reduced even for the ‘higher’ serving probabilities and therefore using 50-40 games in playing an advantage final set is quite plausible.

Serving Probabilities	(i)	(ii)	(iii)	(iv)	(v)	(vi)
p_A=0.53, p_B=0.50	67.1%	67.0%	63.9%	0.5%	0.2%	0.0%
p_A=0.63, p_B=0.60	67.7%	67.7%	64.4%	0.4%	0.8%	0.0%
p_A=0.73, p_B=0.70	68.1%	67.9%	64.8%	2.4%	0.6%	0.0%
p_A=0.83, p_B=0.80	69.0%	68.1%	66.0%	13.4%	2.7%	4.9%

Table 5: Characteristics of scoring systems using 50-40* games across a range of serving probabilities

The 50-40* game is somewhere between the 50-40 and 60-50 game, and thus slightly increases the chances of the better player winning the match for the ‘lower’ serving probabilities. However there is the added complexity for the players to mentally keep score in such a game.