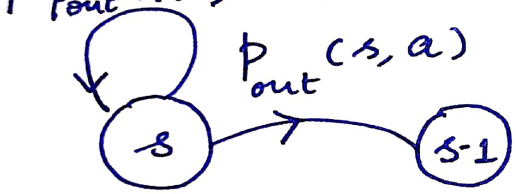
1 OPTIMAL BATTING FIRST STRATEGY

* $S = \{ 10, 9, \ldots, 2, 3, 1 \}$

WICKETS IN HAND

* $T = 300, 299, \ldots, 1$

NUMBER OF BALLS LEFT



* $A = \{ 1, 2, 3, 4, 6 \}$

* $R(s,a) = a$, w.p $p_{run}(s) \cdot (1 - p_{out}(s,a))$

Strike rate

when we do not get out

$= 0$ otherwise

2 TRANSITION MODEL (A SIMPLIFIED MODEL)

ACTION i.e. SHOT	1	2	3	4	6
p_{out}^{max}	0.1	0.2	0.3	0.5	0.7
p_{out}^{min}	0.01	0.02	0.03	0.1	0.3

$$p_{out}(s,a) = p_{out}^{max}(a) + \left(p_{out}^{min}(a) - p_{out}^{max}(a)\right)\frac{(s-1)}{9} \quad ..$$

* TOP BATSMEN OR OPENING PAIR

$$p_{out}(10,a) = p_{out}^{max}(a) + \left(p_{out}^{min}(a) - p_{out}^{max}(a)\right)\frac{(10-1)}{9}$$

$$= p_{out}^{min}(a)$$

WHEN $s = 10$ (10 WICKETS IN HAND)

$p_{out}^{min}(1) = 0.01$ (IF OPENERS ARE TAKING SINGLES IT ON AVG. TAKE $1/0.01$ BALLS TO GET OUT)

3 TRANSITION MODEL : CONT...

$$p_{out}(10,a) = p_{out}^{min}(a) \quad , \quad p_{out}(10,6) = p_{out}^{min}(6) = 0.3$$

OPENERS GET OUT IN 1/0.3 BALLS ON AVERAGE IF THEY TRY TO HIT A SIX EVERY BALL

$$p_{out}(1,a) = p_{out}^{max}(a) + (p_{out}^{min}(a) - p_{out}^{max}(a)) \frac{(1-1)}{9}$$

$$= p_{out}^{max}(a)$$

$$p_{out}(1,6) = p_{out}^{max}(6) = 0.7$$

LAST BATSMEN TRY TO HIT A SIX THEN THEY GET OUT IN 1/0.7 BALLS (ON AVG)

4 TRANSITION MODEL : CONT...

$$p_{run}(s) = p_{run}^{min} + \left(p_{run}^{max} - p_{run}^{min}\right) \times \frac{(s-1)}{9}$$

$$p_{run}^{max} = 0.95$$

$$p_{run}^{min} = 0.5$$

} Models Strike rate

$$p_{run}(10) = p_{run} + \left(p_{run}^{max} - p_{run}^{min}\right) \times \frac{(10-1)}{9}$$

$$= p_{run}^{max}$$

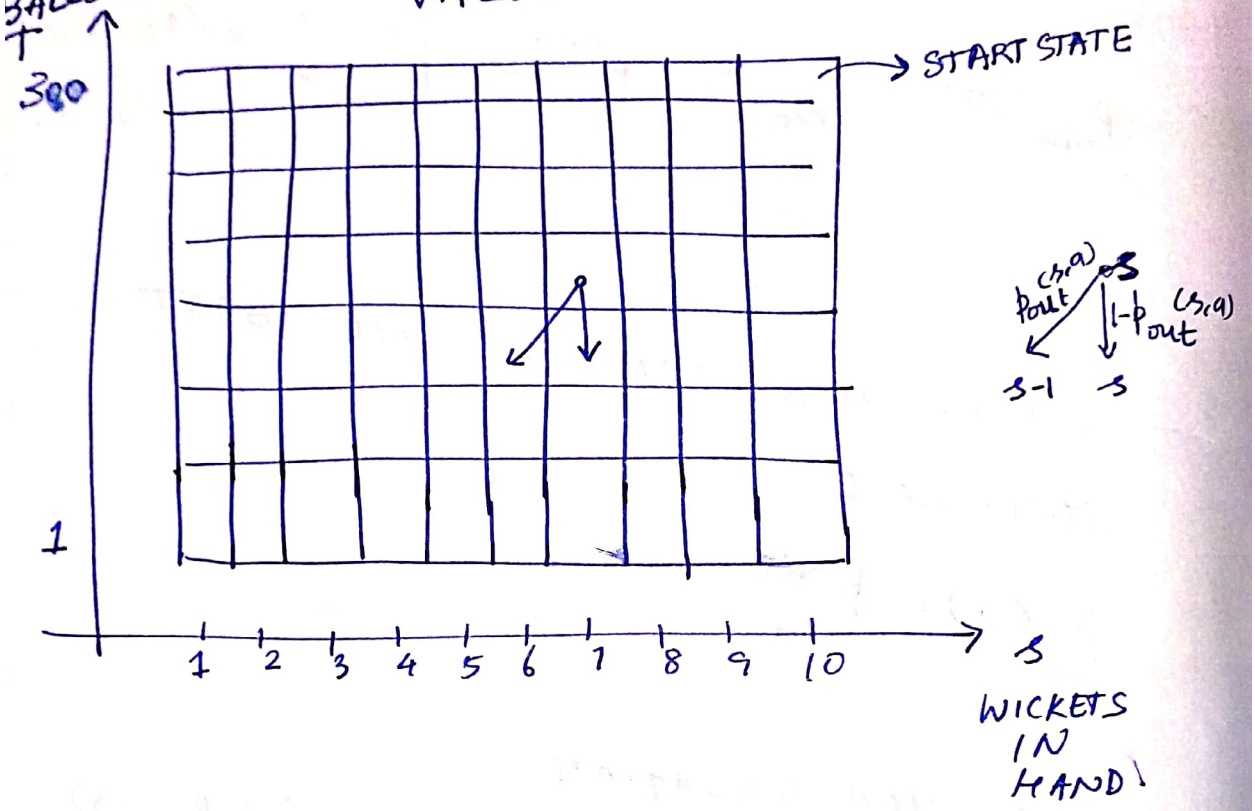
TOP BATSMEN / OPENERS HAVE BEST STRIKE RATE

$$p_{run}(1) = p_{run}^{min}$$

5 BELL MAN EQUATION

$$V_{*,T}(s) = \max_{a \in \{1,2,3,4,6\}} \{ (1 - p_{out}(s,a)) [p_{run}(s) \times a + V_{*,T-1}(s)] + p_{out}(s,a) [0 + V_{*,T-1}(s-1)] \}$$

VALUE TABLE (300 x 10 values)



$$\pi_{*,T}(s) = \operatorname{argmax}_{a \in \{1,2,3,4,6\}} \{ (1 - p_{out}(s,a)) [p_{run}(s) \times a + V_{*,T-1}(s)] + p_{out}(s,a) [0 + V_{*,T-1}(s-1)] \}$$

SHOT TABLE (300 x 10 Shots)