AFL SPORTS ANALYSIS

Sports analytics (i.e., the application of data science techniques to competitive sports) is a rapidly growing area of data science. In this project, we will look at some very basic analytics applied to the outcomes of consecutive games of Australian Rules Football (AFL).

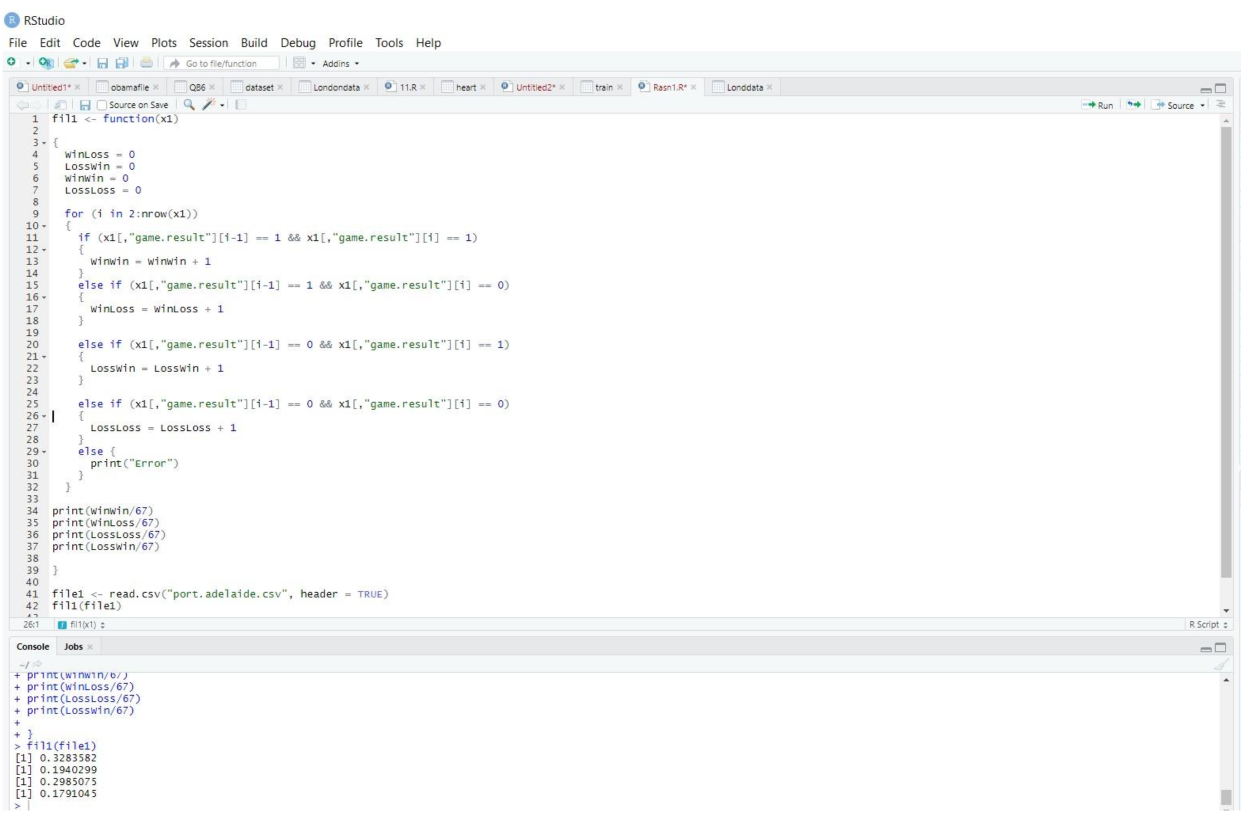
Empty table: Proportion of wins/losses for Port Adelaide (Wt) given whether they won/loss their previous game (Wt−1).

port.adelaide.csv contains a record of the outcomes of games of AFL played by the Port Adelaide (PA) football club in the seasons 1998, 1999, 2000 and the first two rounds of 2001.

The data is sequential, in the sense that each recorded binary variable records a win (1) or a loss (0) in the order in which the games were played.

A simple question regarding this type of data might be regarding the existence of (de)motivating effects on a team if they have won/lost their previous game. Let Wt denote the outcome a game and Wt−1 denote the outcome of the game played in the previous round.

2a) The frequency with which PA won/lost a game after it won/lost its previous game.



As shown above, R code is attached along with the output.

Using these proportions, calculate the marginal probability of PA winning a game irrespective of whether they won or lost their previous game, i.e., P(Wt = 1) and What is the probability that PA will win a game given that they won their previous game?

	$W_t = 0$	$W_t = 1$
$W_{t-1} = 0$	0.298582 ≈ 0.2986	0.1791045 ≈ 0.1791
$W_{t-1} = 1$	0.194029 ≈ 0.1940	0.3283582 ≈ 0.3283

2(b) :-

→ let W_{t-1} be previous game and W_t be current game ~~which losin~~

→ While, losing the ~~ga~~ game represents 0 and winning to be equal to 1.

$$* \ Pr(\text{winning the game}) = Pr(W_t = 1)$$

$$= 0.1791 + 0.3283$$

$$= \boxed{0.5074}$$

2(c) :

* Probability (winning a game given they ~~lost~~ won their previous ~~game~~ game)

$$= P(W_t = 1 \mid W_{t-1} = 1)$$

$$= \frac{P(W_t = 1, W_{t-1} = 1)}{P(W_{t-1} = 1)}$$

$$= \frac{0.3283}{0.3283 + 0.1940} = \frac{0.3283}{0.5223} = \boxed{0.62856}$$

What is the probability that PA will win a game given that they lost their previous game?

Do you think winning/losing the previous game had an effect on the PA players in their next game? That is, do you think the events Wt−1 and Wt are independent or not?

Calculate the probability of PA losing their next two games given that they won their previous game.

(d.) Probability of winning the game given they lost the previous game,

$$\Rightarrow P(W_t=1 \mid W_{t-1}=0) = \frac{P(W_t=1, W_{t-1}=0)}{P(W_{t-1})}$$

$$= \frac{P(W_t=1, W_{t-1}=0)}{P(W_{t-1}=0, W_t=0) + P(W_{t-1}=0, W_t=1)}$$

$$= \frac{0.1791}{0.1791 + 0.2985}$$

$$= \frac{0.1791}{0.4776} = \boxed{0.3750}$$

(e.) To see the effect mathematically, we will check whether the events of winning or losing is independent or not,

$\Rightarrow$ for, $P(W_t=0 \mid W_{t-1}=0) = \dfrac{0.2985}{0.2985+0.1791} = 0.6250$

$\rightarrow$ while, $P(W_t=0, W_{t-1}=0) = 0.2985 \neq 0.6250$

* Hence, ~~there's~~ two consecutive events of losing are not independent

* for, $P(W_t=1 / W_{t-1}=0) = \dfrac{0.1791}{0.1791+0.2985} = 0.3750$

$\neq 0.1791$

* for, $P(W_t=1 / W_{t-1}=1) = \dfrac{0.3283}{0.3283+0.1940} = 0.6285$

$\neq 0.3283$

* For, $P(W_t = 0 \mid W_{t-1} = 1) = \frac{0.1940}{0.3283 + 0.1940} = 0.3715$

$\neq 0.1940$

⇒ Hence, It can be proved that the event of losing or winning the game has an effect on winning or losing the next game as none of these events are independent in any way.

→ The player does have their mind-set or point of view where they think what might happen if they lose the next game or if they win the next game. Sometimes, teams cannot qualify for the next round if they don't win enough games. Some team cop up the situation while some have lack of experience and lose the games. Hence, winning or losing the previous game makes significant impact on the next coming game.

(F) → Probability of losing two (next) games given they won their previous game.

→ As, the probability of winning or losing only depends on the previous game result.

→ So, there can be two cases (situation) happening in sequence,

⇒ $P(W_t = 0 \mid W_{t-1} = 0) \times P(W_t = 0 \mid W_{t-1} = 0$

* As this can give the probability of losing two games in a row based on the previous game.