

# USING BETTING MARKETS TO DERIVE “MORE LIKELY” VALUES IN PROBABILITY ASSESSMENT

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### INTRODUCTION

If event A pays a winning amount of twice that for event B per \$1 bet, we would expect the probability of B occurring or  $P(B)$  to be about twice that of  $P(A)$ . This would make the expected value of each bet of the same amount approximately the same. Using this principle, the winning amounts for each event can be used to derive “more likely” values and resulting probabilities.

### AUSTRALIAN NRL FINALS

The 2025 NRL championship finals rounds are used to illustrate the procedure. Currently six teams are engaged in games leading to the determination of the Grand Final winner. Data on the betting market is shown in Table 1 with the Bulldogs least favoured to be champions and the Storm most favoured currently.

**TABLE 1: WIN PROBABILITIES FOR LAST SIX TEAMS IN THE NRL FINALS**

| TEAM     | WIN \$ | MORE LIKELY VALUES | COMPOUND ML*       | PROBABILITY           | PERCENT    | EV(\$1 Bet) |
|----------|--------|--------------------|--------------------|-----------------------|------------|-------------|
| Bulldogs | 22.00  | Base = 1.00        | 1.00               | $1.00/30.98 = 0.032$  | 3          | - 0.2640    |
| Sharks   | 12.00  | $22/12 = 1.83$     | $1.83*1.00 = 1.83$ | $1.83/30.98 = 0.059$  | 6          | - 0.2330    |
| Raiders  | 6.50   | $12/6.5 = 1.85$    | $1.85*1.83 = 3.38$ | $3.38/30.98 = 0.109$  | 11         | - 0.1825    |
| Panthers | 3.50   | $6.5/3.5 = 1.86$   | $1.86*3.38 = 6.29$ | $6.29/30.98 = 0.203$  | 20         | - 0.0865    |
| Broncos  | 2.75   | $3.5/2.75 = 1.27$  | $1.27*6.29 = 8.00$ | $8.00/30.98 = 0.258$  | 26         | - 0.0325    |
| Storm    | 2.10   | $2.75/2.1 = 1.31$  | $1.31*8 = 10.48$   | $10.48/30.98 = 0.338$ | 34         | 0.0478      |
|          |        |                    | <b>30.98</b>       | <b>0.999</b>          | <b>100</b> |             |

\*ML = More Likely

The expected value per bet of \$1 is shown in the last column of Table 1. The above market suggests only one of the last three teams listed have a realistic chance of being the 2025 champion with a collective 80% chance for one of the three. Note that public betting markets in Australasia usually show the winning dollars paid per \$1 bet including the initial \$1 wager (i.e., \$23 for the Bulldogs). Betting margins retained are typically 5% - 8% of the total pool.

To expand the analysis, more likely values in the 1.80s as in Table 1 could use a pairwise range of 1.75 – 2 and the lower values a range of say 1.2 – 1.5. This shows sensitivity of the probabilities to changes in the “more likely” values in either direction which could assist the decision-maker in finalizing probabilities. The results are shown in Table 2 below.

**TABLE 2: PROBABILITIES USING PAIRWISE RANGES**

| TEAMS    | LIKELIHOOD RATIOS    | PAIRWISE RANGES | PROBABILITIES |              |              |            | MORE LIKELY VALUES |         |
|----------|----------------------|-----------------|---------------|--------------|--------------|------------|--------------------|---------|
|          |                      |                 | LOW END       | HIGH END     | AVERAGE      | PERCENT    | AVERAGE            | PERCENT |
| Bulldogs | Base $\Rightarrow$ 1 | 1 – 1           | 0.039         | 0.022        | 0.031        | 3          | Base               | Base    |
| Sharks   | Sharks/Bulldogs      | 1.75 – 2.0      | 0.069         | 0.044        | 0.057        | 6          | 1.84               | 2.00    |
| Raiders  | Raiders/Sharks       | 1.75 – 2.0      | 0.121         | 0.089        | 0.105        | 10         | 1.84               | 1.67    |
| Panthers | Panthers/Raiders     | 1.75 – 2.0      | 0.212         | 0.178        | 0.195        | 20         | 1.85               | 2.00    |
| Broncos  | Broncos/Panthers     | 1.2 – 1.5       | 0.254         | 0.267        | 0.260        | 26         | 1.33               | 1.30    |
| Storm    | Storm/Broncos        | 1.2 – 1.5       | 0.305         | 0.400        | 0.352        | 35         | 1.35               | 1.35    |
|          |                      |                 | <b>1.000</b>  | <b>1.000</b> | <b>1.000</b> | <b>100</b> |                    |         |

The results for Tables 1 and 2 are almost identical for percentage probabilities, however, the Storm probability could be 30% to 40%, which is quite a range for the decision-maker to consider.

ANALYSIS FOR THE LAST FOUR TEAMS

The Raiders and Bulldogs were eliminated with odds quoted for the last four teams from least to most likely as shown in Table 3.

TABLE 3: QUOTED ODDS FOR LAST FOUR TEAMS IN THE NRL FINALS

| TEAM     | ODDS | WIN PROBABILITIES | PERCENT | MORE LIKELY VALUES | EV(\$1 Bet) |
|----------|------|-------------------|---------|--------------------|-------------|
| Sharks   | 15/2 | 2/17 = 0.118      | 12      | Base ⇒ 1           | 0.006       |
| Broncos  | 10/3 | 3/13 = 0.231      | 23      | 0.231/0.118 = 1.96 | 0.003       |
| Panthers | 9/4  | 4/13 = 0.308      | 31      | 0.308/0.231 = 1.33 | 0.004       |
| Storm    | 2/1  | 1/3 = 0.333       | 33      | 0.333/0.308 = 1.08 | - 0.001     |
|          |      | 1.000             | 99      |                    |             |

Using the “more likely” values above, a suitable pairwise range is employed to derive the probabilities as shown in Table 4. The pairwise ranges here are possibly narrower than could be expected in a typical application of the procedure.

TABLE 4: PROBABILITIES USING PAIRWISE RANGES

| TEAMS    | LIKELIHOOD RATIOS | PAIRWISE RANGES | PROBABILITIES |          |         |         |          | MORE LIKELY VALUES |         |
|----------|-------------------|-----------------|---------------|----------|---------|---------|----------|--------------------|---------|
|          |                   |                 | LOW END       | HIGH END | AVERAGE | PERCENT | PREVIOUS | AVERAGE            | PERCENT |
| Sharks   | Base ⇒ 1          | 1 – 1           | 0.136         | 0.096    | 0.116   | 12      | 7        | Base               | Base    |
| Broncos  | Broncos/Sharks    | 1.80 – 2.20     | 0.246         | 0.210    | 0.228   | 23      | 30       | 1.97               | 1.92    |
| Panthers | Panthers/Broncos  | 1.25 – 1.50     | 0.308         | 0.315    | 0.312   | 31      | 23       | 1.37               | 1.35    |
| Storm    | Storm/Panthers    | 1.00 – 1.20     | 0.308         | 0.379    | 0.344   | 34      | 40       | 1.10               | 1.10    |
|          |                   |                 | 1.000         | 1.000    | 1.000   | 100     | 100      |                    |         |

Both probability calculation procedures deliver results that differ by at most 1%. The *Previous* probabilities in Table 4 were derived by normalizing the four teams now remaining from the Table 2 probabilities and show the Sharks and Panthers gaining at the expense of the Broncos and Storm. The Storm have lost some key players for the remaining games, reducing their chance in the eyes of analysts.

ANALYSIS FOR GRAND FINAL

The 2025 Grand Final will be the Storm versus Broncos. Currently, the Storm are favoured at 56% to 44%. The complete betting odds are shown in Table 5.

TABLE 5: BETTING ODDS FOR 2025 GRAND FINAL

| TEAMS   | BET \$ | 1/BET \$ | NORMALIZED | PERCENT | EV(\$1 BET) |
|---------|--------|----------|------------|---------|-------------|
| Broncos | 2.15   | 0.465116 | 0.4416     | 44      | - 0.0506    |
| Storm   | 1.70   | 0.588235 | 0.5584     | 56      | - 0.0507    |
|         |        | 1.053351 | 1.0000     | 100     |             |

CONCLUSIONS

In real-world applications, the decision-maker typically does not have large betting markets to aid his/her “more likely” assessments for the (personal) problem at hand. It is, however, reassuring to know that the “more likely” methodology can reproduce collective judgments of major betting markets as shown here.