Social Predict - Weighted Probability Adjustment Model (WPAM) for Payout Distributions

Patrick Delaney

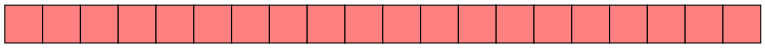
November 2024

1 First Transaction

- **Initial Investment:** Every market is assumed to have an initial investment of at least 1. This investment comes from a fee assessed to the market creator. This initial investment goes both in the numerator and denominator of the probability calculation.
- **Initial Probability:** Every market starts out at a probability of 0.5 which means even odds between a YES and NO outcome.
- **First Transaction:** In our sample below, the first transaction is a bet of 20 Units in the NO direction.

Initial Probability (0.5)

Initial Investment ($I_{\text{initial}} = 10$ units)



NO Bet ($A_{\text{NO}} = 20$ units)

New Probability (0.167)

$$P_{\text{new}} = \frac{P_{\text{initial}} \times I_{\text{initial}} + A_{\text{YES}}}{I_{\text{initial}} + A_{\text{YES}} + A_{\text{NO}}} = \frac{0.5 \times 10 + 0}{10 + 0 + 20} = \frac{5}{30} \approx 0.167$$

---

2 Second Transaction

- **Initial Investment:** The initial investment remains in the calculation.
- **Initial Probability:** We use the same initial probability.
- **Second Transaction:** A different bettor comes in and places 10 in the YES direction.

Initial Probability (0.5)

Initial Investment ($I_{\text{initial}} = 10$ units)

NO Bet ($A_{\text{NO}} = 20$ units)

YES Bet ($A_{\text{YES}} = 20$ units)

New Probability (0.375)

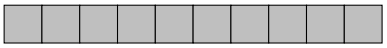
$$P_{\text{new}} = \frac{P_{\text{initial}} \times I_{\text{initial}} + A_{\text{YES}}}{I_{\text{initial}} + A_{\text{YES}} + A_{\text{NO}}} = \frac{0.5 \times 10 + 10}{10 + 10 + 20} = \frac{15}{40} \approx 0.375$$

---

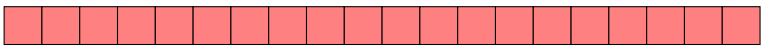
3 Third Transaction

- **Initial Investment:** The initial investment remains in the calculation.
- **Initial Probability:** We use the same initial probability.
- **Third Transaction:** A different bettor comes in and places 10 in the YES direction.

Initial Probability (0.5)

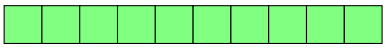


Initial Investment ($I_{\text{initial}} = 10$ units)



NO Bet ($A_{\text{NO}} = 20$ units)

YES Bet ($A_{\text{YES}} = 20$ units)



YES Bet ($A_{\text{YES}} = 20$ units)

New Probability (0.5)

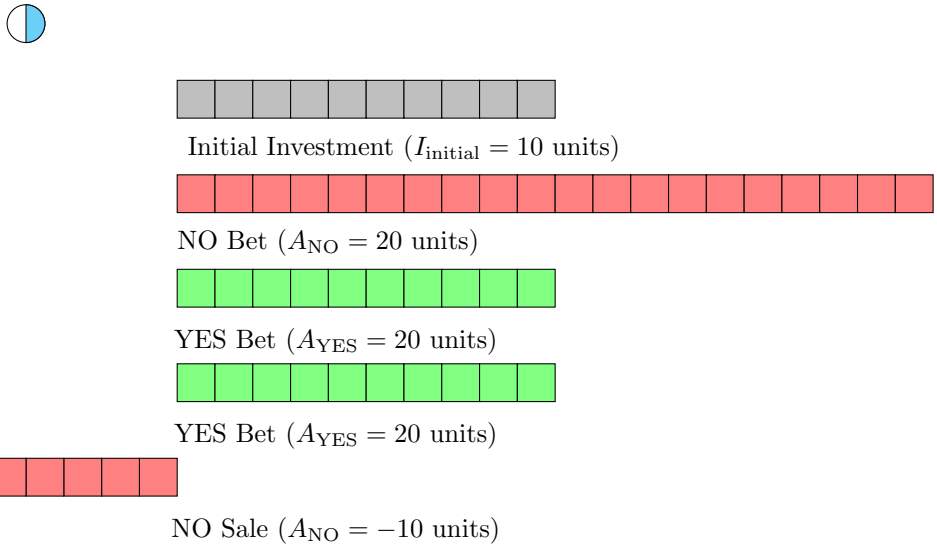
$$P_{\text{new}} = \frac{P_{\text{initial}} \times I_{\text{initial}} + A_{\text{YES}}}{I_{\text{initial}} + A_{\text{YES}} + A_{\text{NO}}} = \frac{0.5 \times 10 + 20}{10 + 20 + 20} = \frac{25}{50} \approx 0.5$$

---

4 Fourth Transaction

- **Initial Investment:** The initial investment remains in the calculation.
- **Initial Probability:** We use the same initial probability.
- **Fourth Transaction:** Original better holding NO sells 10 units of NO.

Initial Probability (0.5)



Initial Investment ($I_{\text{initial}} = 10$ units)

NO Bet ($A_{\text{NO}} = 20$ units)

YES Bet ($A_{\text{YES}} = 20$ units)

YES Bet ($A_{\text{YES}} = 20$ units)

NO Sale ($A_{\text{NO}} = -10$ units)

New Probability (0.625)

$$P_{\text{new}} = \frac{P_{\text{initial}} \times I_{\text{initial}} + A_{\text{YES}}}{I_{\text{initial}} + A_{\text{YES}} + A_{\text{NO}}} = \frac{0.5 \times 10 + 20}{10 + 20 + 10} = \frac{25}{40} \approx 0.625$$
