Machine Learning for Trading – Project 1

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Question 1

Probability of winning 80$ within 1000 bets is 100%. As can be seen in figure 2, the mean has stabilized at $80 around 180 bets already with zero standard deviation. This means all the simulations result in a win ($80) at around 180 spin as the latest.

Question 2

The expected value after 1000 bets should be $80. Related to question 1, the mean reaches $80 at around 180 bets with zero standard deviation.

Question 3

The standard deviation reaches a maximum then stabilize to zero. The reason being as the more bets are done, even though the chance of winning a bet does not change, it only takes one win to recoup all losses and have a positive win. By betting continuously, the chance of a winning streak increases which make winnings reaches $80 at one point. At this point the winnings is set to be constant for the rest of the bets, so the standard deviation is zero.

Question 4

In experiment 2, counting the number of simulations with the last winnings greater or equal to 80$ gives 658. Over 1000, that gives the probability of winning within 1000 spins is 65.8%.

Question 5

In experiment 2, the mean value of the last spins across 1000 simulations is about $-35.13. Therefore, the expected value of winnings after 1000 sequential bets is $-35.13.

Question 6

The standard deviation appears to reach a maximum then stabilize as seen in figure 4. The reason being around spin 180-200, the expected (mean) value has reached a stable distribution of wins ($80) and losses (-$256), which is evident in the flat mean and median lines in figure 4 and 5.
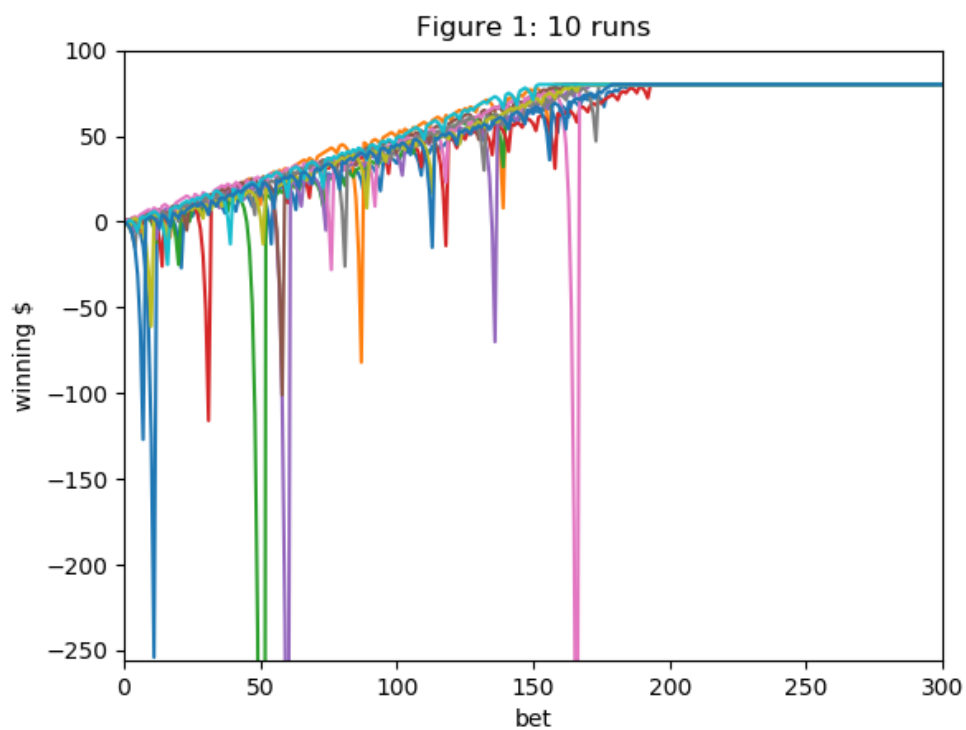
Question 7

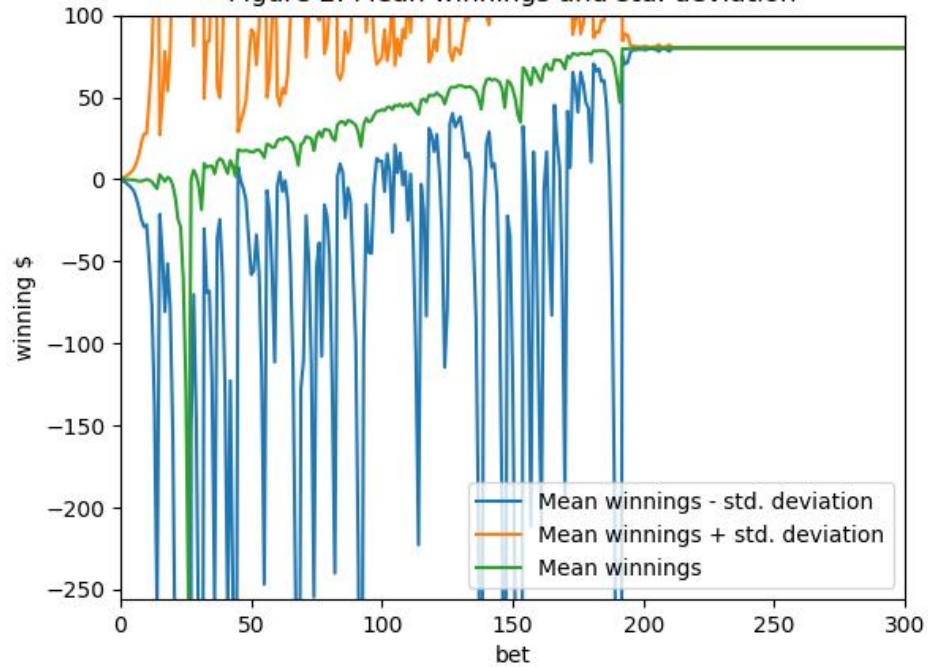Figure 1: 10 runs

Figure 2: Mean winnings and std. deviation

Legend:
- Mean winnings - std. deviation
- Mean winnings + std. deviation
- Mean winnings

Axis labels: winning $ (y-axis), bet (x-axis)

Figure 3: Median winnings and std. deviation

Legend:
- Median winnings - std. deviation
- Median winnings + std. deviation
- Median winnings
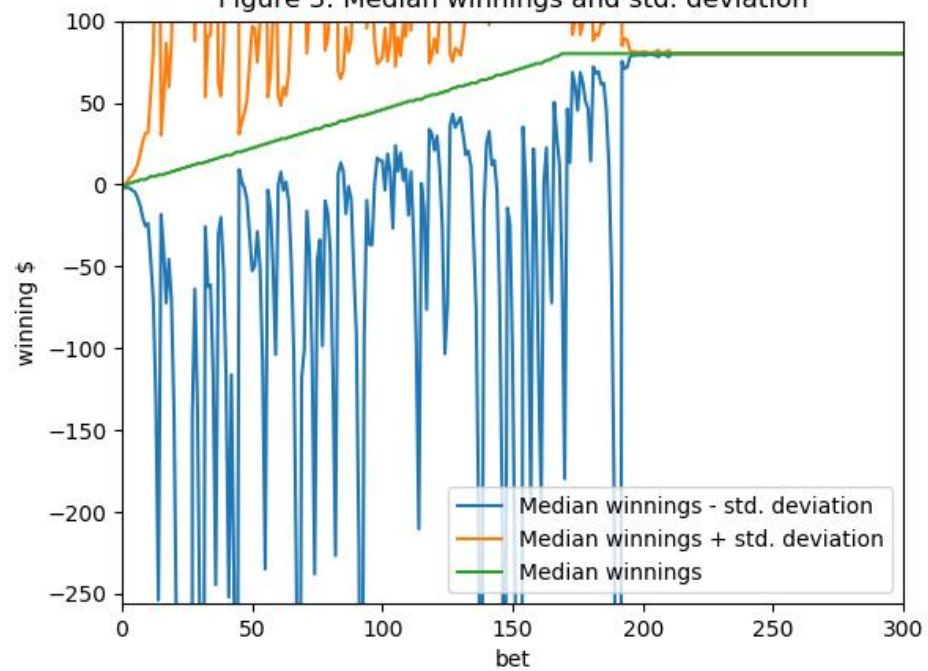
Axis labels: winning $ (y-axis), bet (x-axis)
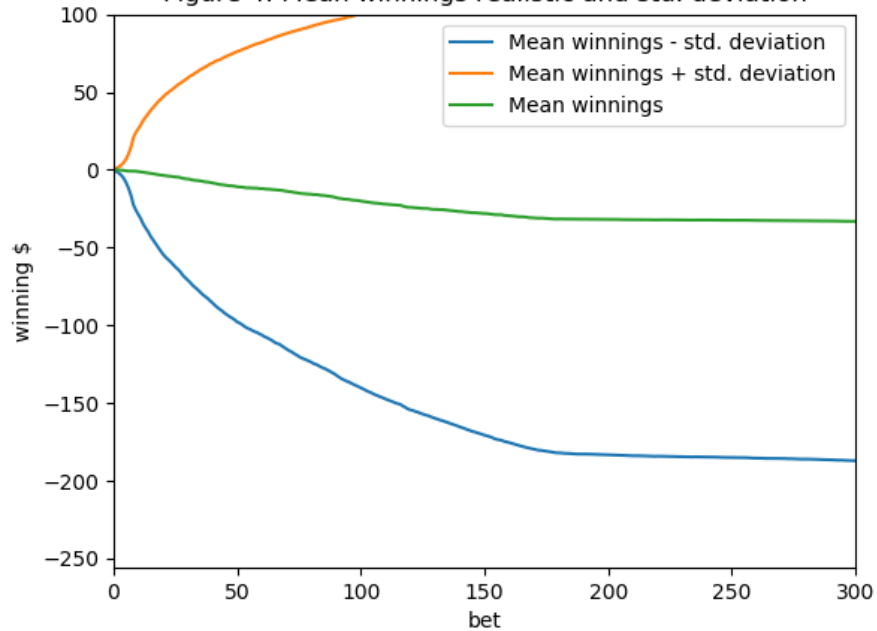
Figure 4: Mean winnings realistic and std. deviation

Figure 5: Median winnings realistic and std. deviation